COAL AGE

Vol. 4 NEW YORK, JULY 5, 1913 No. 1

The Secret

By Berton Braley

Written expressly for Coal Age

The way to reach the man who toils
Amid the dingy workings,
Is not by stratagems and spoils
Or oily smiles and smirkings,
You give him model homes and such,
Or clubs in which to revel,
You still will find yourself "in Dutch,"
Unless you're on the level.

It isn't coddling that he likes,
Or lordly condescension,
Such methods will not stop his strikes
Or banish all contention.
You must be fair and square and just,
A man among your brothers,
Before old doubtings turn to trust
Or ancient hatred smothers.

Whatever motive yours may be,
In time he's sure to find it,
He looks through every deed to see
The spirit that's behind it,
And though he may misunderstand,
Repel, at first, and doubt you,
He'll warmly grasp the proffered hand
When he is sure about you.

The boys within the breaker shed,
The miners, deep below them,
Are slow of faith and hard of head,
You've simply got to show them,
And prove your varied aims and ends
Are *not* those of the devil—
For man and master can be friends—
If *both* are on the level.

A Hydro-Electric Plant to Supply Coal Mines

SYNOPSIS—A plant in Virginia which purposes to find a large market for hydro-electric power in West Virginia coal fields, though these are situated nowhere less than 45 miles from the central station and though some mines which are to be supplied are located 65 miles away.

The question of the ability of hydro-electric plants to transmit power several miles so as to compete with steam plants using waste fuel at the coal mines is being tried in southern West Virginia. The company expects to use a steam-power plant at times of low water or excessive load. Another power house on which reliance is placed, is that of the Roanoke Railway and Light Co., which is situated 116 miles from the coal fields by railroad. As this plant is operated by steam, it will be placed at a great disadvantage in competing with a plant at a mine receiving its coal direct from the mine tipple. Yet, as it is a standby plant, it will probably be but little used.

The Norfolk and Western R.R., which is about to electrify its lines through this same coal field is reported to be about to erect a steam-power house for its own use, at Bluestone, though the lines of this hydro-electric company will approximately parallel the railroad. The length of line to be so electrified is 30 miles but the actual trackage is in the neighborhood of 85 miles. Apparently, the railroad officials believe they can produce their own power more cheaply than they can buy it.*

Among recent hydro-electric developments which are worthy of special notice, is that of the Appalachian Power Co. This corporation was organized in May, 1911, to develop the water power of the New River, in Virginia, and to distribute it by electric transmission through southwestern Virginia and southern West Virginia.

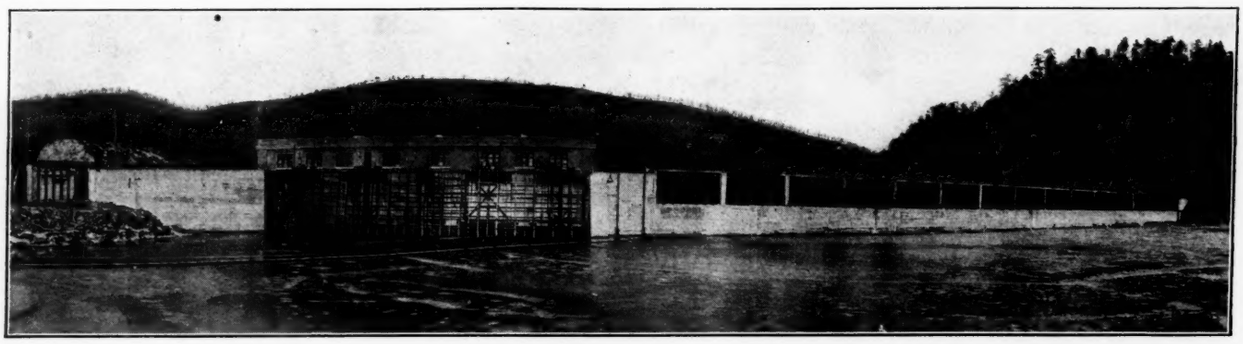


FIG. 1. VIEW OF NO. 2 PLANT AND SPILLWAY DAM FROM ABOVE

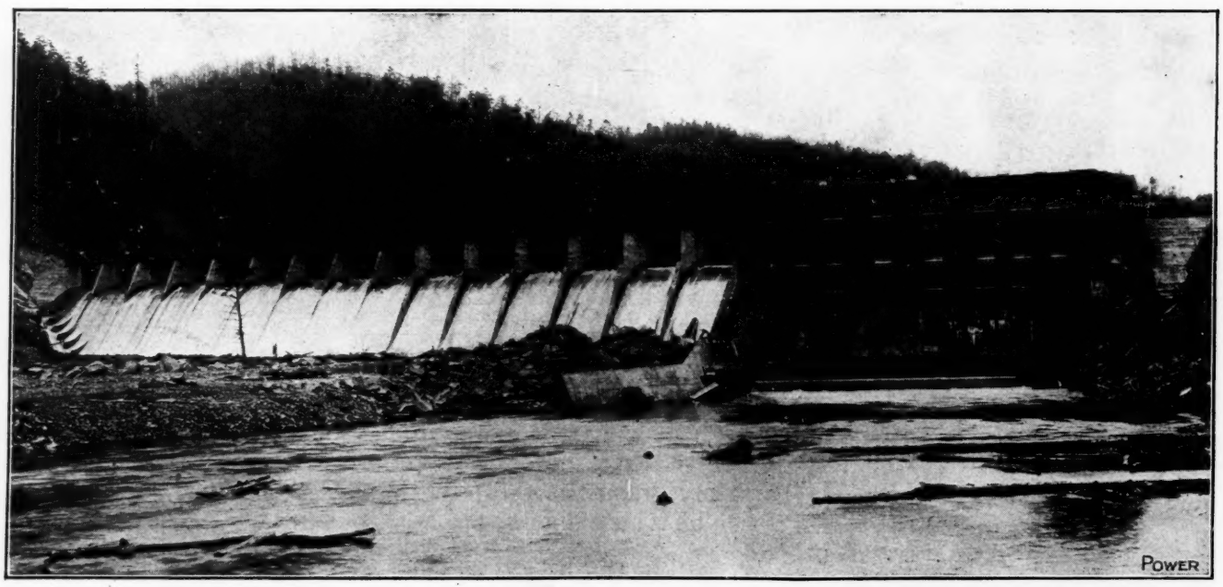


FIG. 2. NO. 2 POWER PLANT AND SPILLWAY FROM BELOW

When completed, this development will consist of five dams and power houses to be known as Nos. 1, 2, 3, 4 and 5. They will all be built on the New River in Carroll and Pulaski Counties, Va. The aggregate water head will be 225 ft. and the total capacity of these plants will be 75,000 hp. Already plants Nos. 2 and 4, with a combined output of 29,000 hp., have been completed.

Plant No. 2 consists of a dam, the main spillway of which is 504 ft. and the low spillway 198 ft. long. The

*Note—The concluding remarks are quoted from an article by Warren O. Rogers on the "Appalachian Hydro-Electric Development," which appeared in "Power," Mar. 25, 1913.

power house is built in one end of the dam, the overflow of the latter being approximately 50 ft. in height. The dam is built directly across the river. An auxiliary spillway above the power house has been constructed by cutting through a ridge. This discharges into a natural

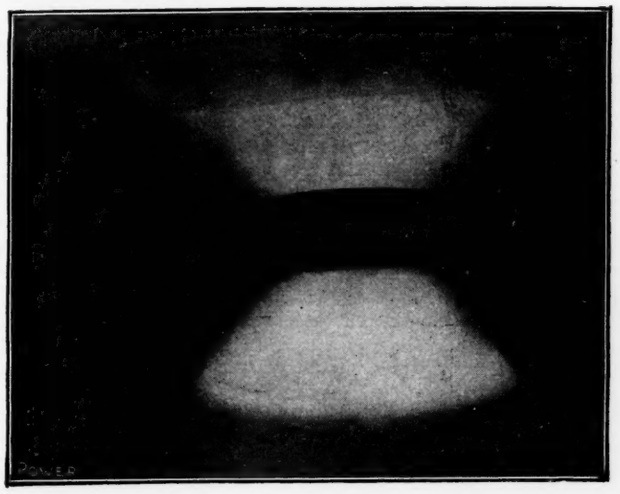


FIG. 3. CONCRETE WHEEL PIT

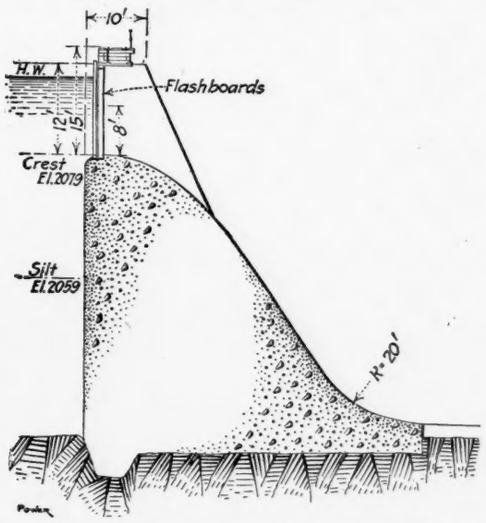


FIG. 4. SECTION OF SPILLWAY PLANT NO. 4

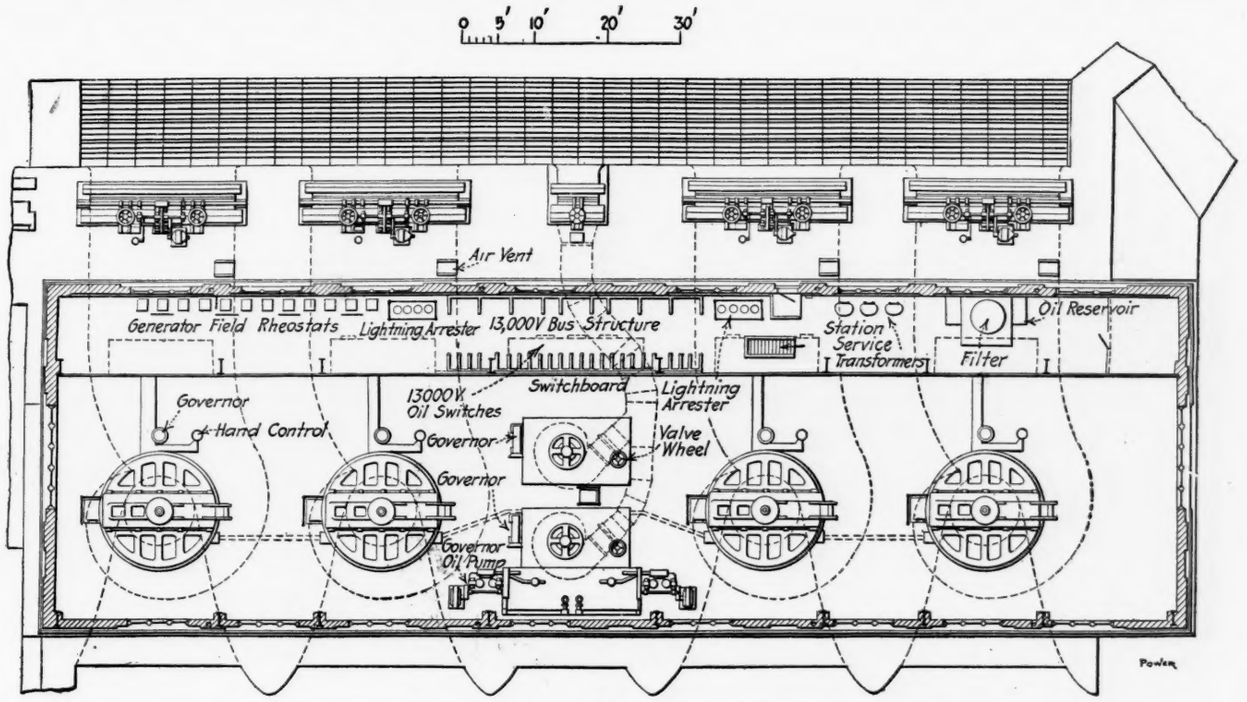


FIG. 5. PLAN OF NO. 2 POWER HOUSE

sluiceway back of the ridge; thus saving approximately 200 ft. of dam work. The dam is of concrete and the power house of brick and steel. There are five hand-operated and one motor-operated 6x30-ft. Tainter gates in the main spillway dam, and nine spans of flashboards. The low spillway has six spans of flashboards, which can be applied to a height of 8 ft. The total length of the spillway is 702 ft. There is also a sluice duct for passing drift wood at the end of the power house. The tailrace is 400 ft. long, 90 ft. wide and has an average depth of 12 ft. Approximately 11,000 cu.yd. of material were excavated.

POWER HOUSE NO. 2

In this power house there are four vertical-shaft units generating 5000 electrical horsepower. The waterwheels are of the single-runner Francis type. The wheel rests on a circular concrete foundation, and water enters the wheel casing through a spiral-shaped passage formed in the concrete of the foundation. This construction is shown in Fig. 3, which is a view in the wheel pit.

These four waterwheels are coupled by vertical shafts to four 4000-kw., 13,200-volt, three-phase, 60-cycle generators of the internal revolving-field type. The speed is 116 r.p.m. The water from the wheels discharges through concrete draft tubes into the tailrace in the river bed. Water is admitted to the waterwheels through eight 14x25-ft. motor-operated, screw-actuated sluice gates. With the flashboards in place the average head of water

FIG. 6. PANORAMIC VIEW, SHOWING NO. 4 POWER PLANT, HEADRACE AND SPILLWAY

to the wheels is 53 ft. The Tainter gates and flashboards are for storing the water and regulating the head. By this arrangement, ample water can be stored above the dam for operating the plant at any daily load factor.

EXCITER UNITS

Between Nos. 2 and 3 generators are two water-turbine-driven exciter units. The wheels are of the inward discharge, single-runner type and are rated at 430 hp. each. They are set vertical and are shaft-connected to two 600-amp., direct-current, 250-volt generators, running at 330 r.p.m. The speed of the units is controlled by a special type of oil-actuated hydraulic governor. The same type of equipment is installed in No. 4 power plant, the only difference being that in the latter plant the two exciter units are located at one end of the generator room, and are of slightly smaller capacity.

MACHINES FOR OIL SYSTEM OF GOVERNING

Both power houses contain two triple-plunger, motor-driven oil pumps for operating the governors. The motors are of the induction type and of 25 hp. capacity. They operate with three-phase, 60-cycle current, of 220 volts, at a speed of 845 r.p.m. The motors are gear-connected to the pump crankshaft.

A 7¼x3¾x6-in. motor-driven air compressor is at one side and at one end of each plant. The 10-hp. motor is of the induction type. It operates with three-phase, 60-cycle, 220-volt current, at a speed of 1145 r.p.m., and is gear-connected. The air is used to maintain a uniform pressure of 200 lb. in the tanks of the oil system supplying the turbine governors.

Power House No. 2 is of brick with concrete foundations. It is 162½ ft. long and 89½ ft. wide from the rack to the end of the draft tube. As the electrical equipment is practically the same in both plants the description of plant No. 2 will apply equally well to No. 4.

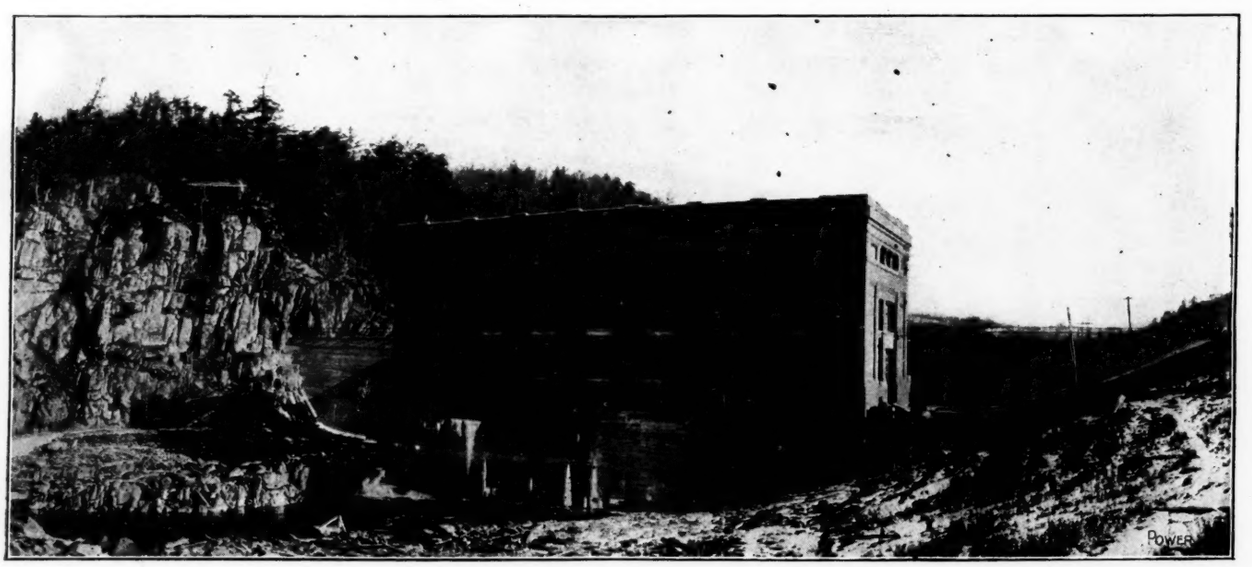
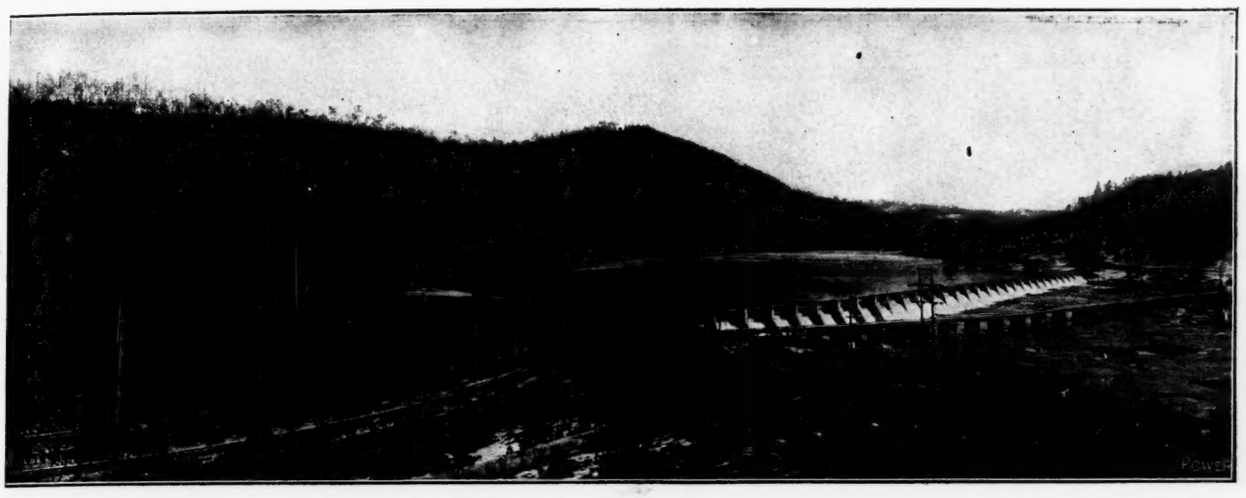


FIG. 7. NO. 4 POWER PLANT FROM BELOW THE DAM

A cross-section of No. 2 spillway dam is shown in Fig. 4, and a plan view of No. 2 power house in Fig. 5.

PLANT NO. 4

Although plant No. 4 is the smaller of the two, it is of no less interest. It is between Mountain Island in the New River and the river bank. The spillway dam is



DAM ON THE NEW RIVER IN VIRGINIA; MOUNTAIN ISLAND IN THE FOREGROUND

at the upper end of the island, extending from the south shore of the island to the south shore of the river; the power house is at the other end of the island and it and its dam extends from the north end of the island to the north bank of the river.

The spillway dam, which is built across the main channel of the river, is 1005 ft. long. It has six spans of Tainter gates and 24 spans of flashboards designed for 6½ ft. height. This dam diverts the water to the power house which, with the retaining dam, is at the lower end of this natural headrace.

Below the power house is a tailrace 1900 ft. long, 60 ft. wide and 12 ft. deep. This necessitated the removal of 66,000 cu.yd. of rock. This tailrace provides for an additional head of 15 ft., giving a total average head of 38 ft. Fig. 5 is a general plan of plant No. 4, Fig. 6 a panoramic view of the headrace, spillway dam and power plant, and Fig. 7 is the view from below No. 4 power house. The building is a brick and steel superstructure, 126 ft. long and 34 ft. 4 in. wide, with a solid concrete foundation. The equipment comprises three 3000-hp. units, with vertical-shaft, single-runner waterwheels.

Mounted on the upper ends of the shafts of these wheels are three 2300-kw., 13,200-volt, three-phase, 60-cycle, internal-wound, revolving-field generators; the speed of each is 97 r.p.m. Fig. 8 is a cross-section of No. 4 power house. Fig. 14 is a view of the generating units in plants No. 2.

The special type of double floating-lever governor used is operated from the generator shaft, by bevel gears and shafting. It is oil-controlled, and operates a piston and a lever connected to a rocking ring above the outer casing of the waterwheel. The rocker ring operates the arms attached to the stems of the 20 gate vanes set in the inlets of the waterwheel casing. As the speed of the wheel increases the governor closes the gate vanes enough to shut off the flow of water to the wheel and to maintain a constant speed. If the wheel tends to slow down the vanes are opened.

The exciter waterwheels have 14 gate vanes, similarly

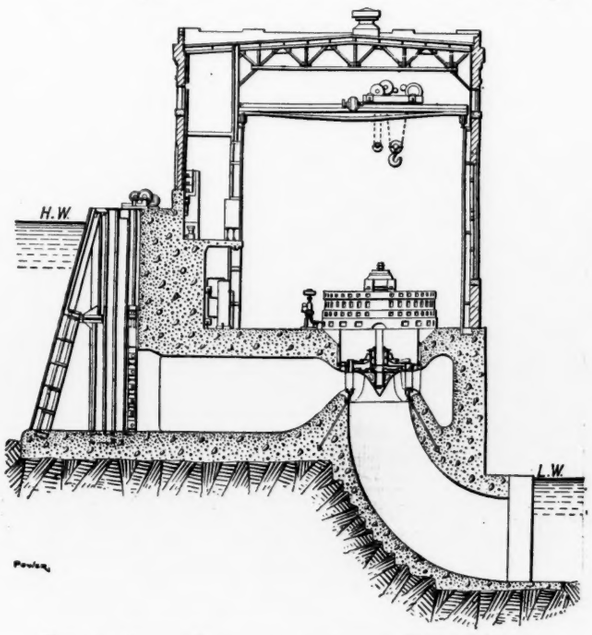


FIG. 8. CROSS-SECTION OF POWER HOUSE NO. 4, SHOWING TURBINE AND GENERATOR

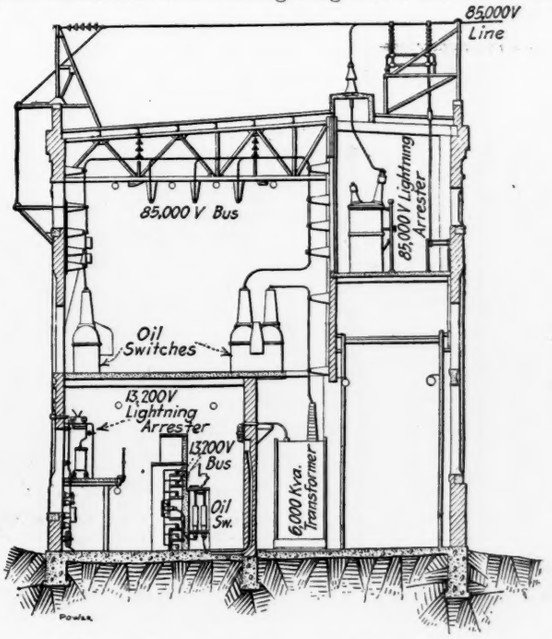


FIG. 9. CROSS-SECTION THROUGH STEP-UP TRANSFORMER HOUSE

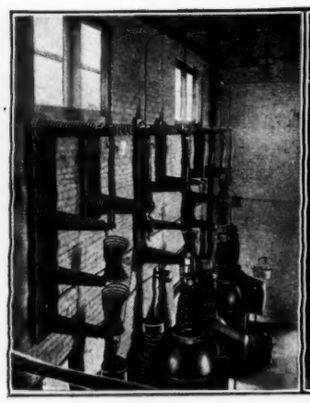


FIG. 10. CHOKE COILS IN TRANSFORMER HOUSE

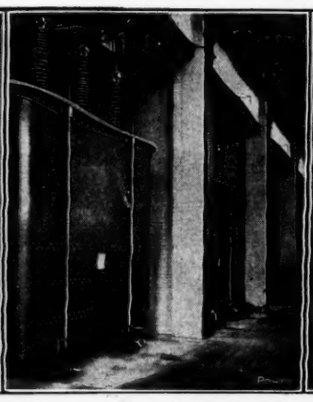


FIG. 11. 6000-KV.-A. TRANSFORMERS

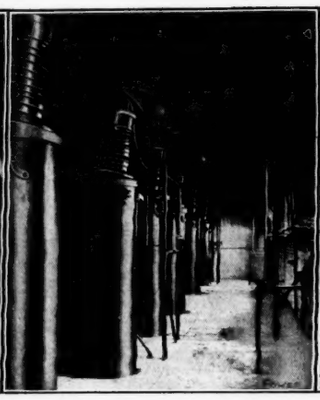


FIG. 12. SINGLE-PHASE TRANSFORMERS

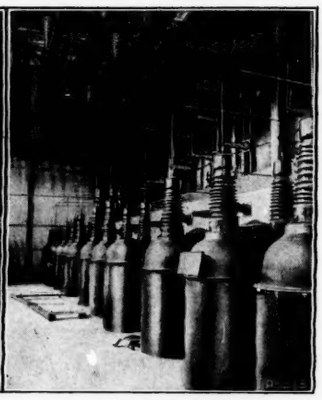


FIG. 13. OIL SWITCHES FOR TRANSFORMERS

controlled. The generating and exciter units in both plants are governed in the same way. The shaft of each unit is hung on roller bearings at the top with two steadying bearings below the generator. These bearings are lubricated by a gravity-flow oil system, oil from the bearing flowing to a well and being pumped to the bearings again by a small rotary pump, belt-driven from the generator shaft.

In case of an accident to the governor and when starting up the machines, the flow of water to the waterwheels can be controlled by hand.

ELECTRICAL CONTROL APPARATUS

In both plants the switchboard apparatus only controls the generators. The switchboards are at one side of the building. Back of them are the busbars, in concrete isolated compartments. All oil switches are remote-controlled and are of 13,200-volt capacity. They are on the concrete balcony above the switchboards. The field rheostats are on the balcony, also the lightning arrester with the helical choke coils on the two No. 000, 13,200-volt lines which extend to the transformer house near No. 2 plant.

MECHANICAL EQUIPMENT OF PLANTS NOS. 2 AND 4 OF THE APPALACHIAN POWER CO.

No.	Equipment	Make	Purpose	Kw.	Volts	Amp.	Phase	Cycles	R.p.m.	Hp.	Size	Manufacturers
4	Water wheels	Francis	Main units	....	....	....	....	....	116	3500	....	I. P. Morris Co.
3				....	....	....	....	....	97	3000	....	
2			Exciter units	....	....	....	....	....	360	430	....	
2				....	....	....	....	....	330	250	....	
4	Generators	Alt. current	Main units	4000	13,200	....	3	60	116	....	....	General Electric Co.
3				2300	13,200	....	3	60	97	....	....	
2		Direct current	Exciter units	250	250	1000	....	....	360	....	....	
2				250	250	600	....	....	330	....	....	
7	Governors	Hydraulic	Main units	....	....	....	....	....	....	....	....	Lombard Governor Co.
4			Exciter units	....	....	....	....	....	....	....	....	
4	Pumps	Plunger	Oil	....	....	....	....	....	....	....	....	Deane Steam Pump Co.
4	Motors	Induction	Oil Pumps	....	220	70	6	60	845	25	....	Westinghouse Electric and Mfg. Co.
2	Compressors	Motor driven	Compressed air	....	....	....	....	....	....	....	7½x½x6″	Ingersoll-Rand Co.
2	Motors	Induction	Air compressors	....	220	26	6	60	1145	10	....	General Electric Co.

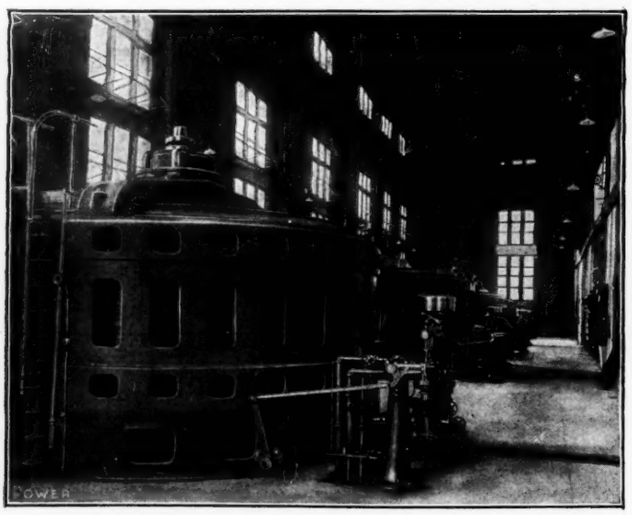


FIG. 14. 4000-KW., 13,200-VOLT GENERATING UNITS IN PLANT NO. 2

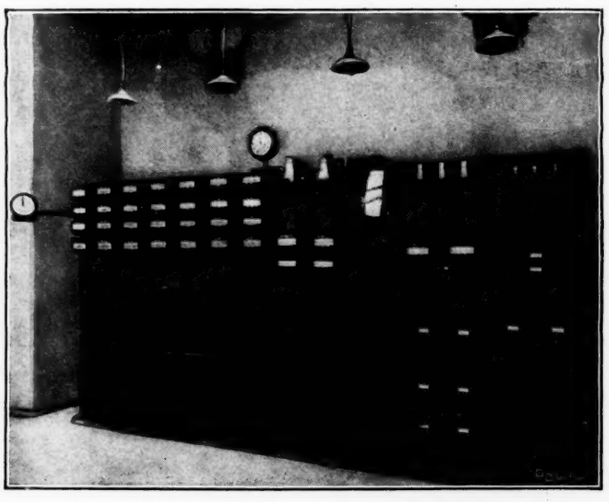


FIG. 15. SWITCHBOARD AT MAIN TRANSFORMER STATION

The waterwheels operate with a head of 38 ft. Water is admitted from the headrace to each wheel pit through two 14x25-ft. motor-operated, double-screw lift gates. The wheels are set on a concrete base, the walls of which are 4 ft. thick, with a draft tube in the center.

Each generator is equipped with an indicator to show the gate opening, and they also have a speed tachometer.

Exciter Units

Both exciter units are at the end of the generator room. Each is of 250 kw. capacity and generates 250-volt current. The waterwheels are of the inverted, single-runner Francis type, each of 250 hp. capacity. The oil pumps

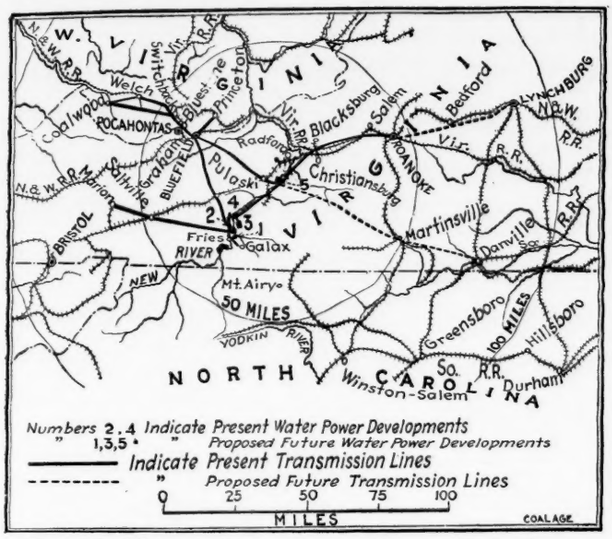


FIG. 16. MAP OF APPALACHIAN POWER CO.'S OPERATIONS

and air compressor are of the same design and size as those of the plant No. 2.

Transformer House

Electrical energy from both power plants is carried by overhead lines supported by wooden poles to the step-up transformer house adjacent to No. 2 development. A cross-section is shown in Fig. 9. Here the electrical energy is transformed from 13,200 to 88,000 volts and distributed over the high-tension transmission system. This transformer house is designed for ultimate extension, so that all of the power from the plants Nos. 1, 2, 3 and 4 will concentrate at this house and be regulated and distributed from it. Fig. 10 illustrates the arrangement of the choke coils.

At present there are four 6000-kw., water-cooled, three-phase transformers (Fig. 11) with 13,200-volt primaries and 88,000-volt secondaries, together with the various regulating and controlling devices, consisting of 21 oil switches, all remote-control, and 12 lightning arresters on a balcony over the transformers. The busbars are in concrete isolated compartments; the transformers are on trucks and can be rolled out of their bays if necessary.

The low-tension, 13,200-volt inlet lines enter the house 15 ft. above the main floor; the high-tension 88,000-volt outlet lines are 59½ ft. above the floor. The transformers are delta connected on both sides. Figs. 12, 13 and 15 show single-phase transformers, oil switches, and the switchboard of the transformer station. The latter is on the ground floor.

Field Distribution

From the transformer house there are three outgoing 88,000-volt lines. One extends to Switchback via Bluefield. The second goes direct to Roanoke, but there is a branch from this line near Pulaski going through Pulaski and on to Bluefield and Switchback. This provides a double circuit into the latter station. The third high-tension line runs direct to Saltville. There is also a high-tension line connecting the Switchback and the Coalwood substations.

In addition there are three 13,200-volt transmission lines outgoing from the transformer house, one direct to Galax, one to Wytheville, on the same poles with the first of the higher tension lines, and one to Hiwassee, mounted on the same poles as the second of the higher tension lines.

The company has a large distribution system in the Pocahontas coal fields radiating from the Switchback and the Coalwood substations. There, a number of contracts have been made with collieries to provide power for their coal-mining operations. This is probably the first instance where a water-power development has supplied power to coal mines.

The company also operates the utilities in the towns of Marion, Wytheville, Pulaski, Bluefield, Pocahontas, Welch and Keystone. It also sells power to the Roanoke Railway & Light Co.

Standby Coal Plants

In addition to the hydro-electric plants there is a 7500-hp. steam plant at Switchback, W. Va., which has been leased by the company, and will be used as a reserve station and to supplement the power from the hydraulic plants. This steam reserve will be in addition to that available from the various steam plants of the utilities purchased by the power company, and also to the steam power available from the steam plant of the Roanoke Ry. & Light Co. The map, Fig. 16, shows the water power, transmission line and district served by these hydro-electric developments.

Viele, Blackwell & Buck, of New York City, are the consulting engineers. This firm built the hydraulic developments and the high-tension transmission lines and substations. H. M. Byllesby & Co., of Chicago, are the engineers and managers of the company. This company built all the low-tension distribution system in the coal field and in the different towns which are now being supplied by the company.

Portland Cement Production in 1912

According to figures of the United States Geological Survey, the production of portland cement in the United States in 1912 was 82,438,096 bbl. This production was reported from 24 states. The first ten, namely, Pennsylvania, Indiana, California, New York, Missouri, Illinois, New Jersey, Michigan, Iowa and Kansas, given in the order of their importance, reported 69,682,321 bbl., or about 85 per cent. of the total.

These states ranged in production from 26,441,338 bbl. in Pennsylvania, to 325,040 bbl. in Kansas. The first three reported over one-half of the total production.

Rocky Mountain Coal Mining Institute

The paper by John McNeil on "Prevention of Accidents and a Higher Standard of Sanitary Conditions in Coal Mines," which was read at the Salt Lake meeting, will be published in our next issue. We also expect to print the paper of D. J. Griffiths, on "Falls of Roof and Sides," in COAL AGE next week.

West Virginia Coal Mining Institute

SYNOPSIS—Following a two-day program, which included the reading of several interesting technical papers, automobile trips to nearby industrial plants and a banquet, the members made an all-day inspection tour of mining and coking plants in the famous Connellsville region.

The summer meeting of the West Virginia Coal Mining Institute convened in Morgantown, Tuesday morning, June 24. Following addresses of welcome by Mayor Stewart and Prof. C. R. Jones, of the State University, came the presidential address of Neil Robinson. After President Robinson had finished his interesting and instructive talk, a paper on "Gasoline Motor Haulage in Mines," was read by R. O. Hodges, mechanical engineer of the George D. Whitcomb Co., Rochelle, Ill. This lengthy discussion on gasoline locomotives will be published in COAL AGE, probably next week.

In the afternoon of the opening day of the convention, the members and friends of the Institute boarded special cars and were taken to Sabraton, where they inspected the works of the American Sheet & Tin Plate Co., and the Pressed Prism Plate Glass Co. Returning to Morgantown at 4 o'clock in the afternoon, the Institute members were taken in automobiles for an extensive ride to the plant of the Hydro-Electric Co. of West Virginia, on Cheat River, and from there to Mt. Chateau, where a luncheon was served.

On Wednesday morning, President Robinson having been called away, George T. Watson, vice-president of the Institute, presided. The following papers were read: "Welfare Work in Mining Communities," by Ira D. Shaw, secretary Central Y. M. C. A., Pittsburgh, Penn.; "The Hess Dustless Mining Machine," by Raleigh C. Taylor, secretary Hess Dustless Mining Machine Co., Ansted, W. Va.; both of these papers are printed elsewhere in this issue.

On Wednesday afternoon, J. Clark Evans, secretary of the Fairmont Mining Machine Co., Fairmont, W. Va., read an interesting paper on "The Uses of Steel Ties in Mining." Following Mr. Evans' address came a talk on "The Power Development on the Cheat River, at Cheat Haven," by George F. Rowell, engineer-in-charge, Cheat Haven, Penn.

The members of the Institute attended a banquet at the Madeira Hotel, Wednesday evening. Short after-dinner talks were given by H. M. Wilson, engineer-in-charge, Bureau of Mines, Pittsburgh, Penn.; Dr. T. E. Hodges, president West Virginia University; Floyd W. Parsons, editor COAL AGE; J. B. Hanford, general superintendent Elkins Coal & Coke Co.; E. B. Wilson, editor *Colliery Engineer;* J. B. Johnston, editor *Coal and Coke Operator;* and E. N. Zern, professor of mining, West Virginia University. Dr. I. C. White, of Morgantown, acted as toastmaster.

On Thursday morning, at 7 o'clock, the Institute members left Morgantown via the B. & O. R.R., for an all-day trip to various modern mining and coking plants in the Connellsville region. Mines of the W. J. Rainey Co., the H. C. Frick Coke Co., and the Oliver & Snyder Steel Co., were inspected. The meeting as a whole was interesting and instructive, although the attendance was not as large as it has been at other recent meetings of the West Virginia Institute.

The Use of Steel Ties in Mining

BY J. CLARK EVANS*

SYNOPSIS—The steel mine tie has not only greater durability than its wood rival, but has the advantage of taking up less room so that in low places either less brushing is required or else the cars can be more fully loaded. The many advantages of steel mine ties in beds of coal of all kinds are here summarized.

The scarcity of timber, among other reasons, has caused the introduction of the steel tie into mining, but that has not been the sole reason for its development. Many operators have realized that the wood tie has several disadvantages, such as excessive cost of handling, short life, and height of track above room floor. At first every operator who used steel ties had a special design of his own, and none were manufactured or used extensively.

It has been only within the past four years that steel mine ties have been put on the market and pushed by manufacturers in this country and the strides this product has made are remarkable. Mines that a few years ago were using a hundred at a time are now ordering them by the car load. I have collected a few statements from mining men relative to the availability of steel ties for use in mining, and I feel that I can do no better than to quote some of these.

RELATIVE FIRST COSTS

C. H. Meade, the general manager of the Peytona Block Coal Co., Peytona, W. Va., states: For laying one pair of rails we use four steel mine ties which cost us 32c. each, or $1.28 per pair of rails. When laying the same length of track with wood ties, we place them at three-foot centers and so have to use 11 cross ties at a cost of 5c. each, or $0.55 per pair of rails. We also use spikes costing about 10c., making the cost for material 65c. as against $1.28 for material where steel ties are used.

To offset this greater cost for material, however, we find that there is a large difference in the labor required to lay the pairs of rails, using the two different methods of keeping them in gage. At most mines, the miners do not object to laying the tracks in their working places themselves if steel ties are used as they can lay them without any tools, but they demand that wood ties shall be placed

*Secretary Fairmont Mining Machinery Co., Fairmont, W. Va.

Note—Paper read before the West Virginia Coal Mining Institute, June 25, 1913, at Morgantown, W. Va.

for them by a track layer. Moreover they can lay the rails and be loading coal in the time they would be waiting for a tracklayer to reach their places. The difference of cost in laying (63c.) is practically absorbed by the time demanded to gather up the necessary wood ties and haul them to the working place, and to pay a track layer to go to the room and lay the rail.

First Cost of Both Ties Really Equal

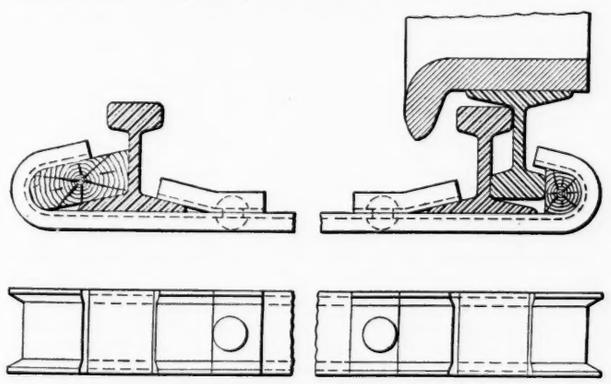
Therefore, I regard the original cost of one pair of rails laid with steel ties and one pair laid with wood ties as practically the same. My experience has been that wood ties are very seldom used more than twice. I have not been using steel ties long enough to make an estimate as to how many times they may be used, but it would certainly take a long time to wear them out.

We find that we recover a much greater number of ties made of steel than we do when they are made of wood. If the top gets bad in a working place it only takes a few minutes' labor to tear up and remove the track if laid with steel ties, and the miner can do this work when to spend the longer time required to remove a track laid with wood ties would be dangerous.

Moreover, if a mine foreman, tracklayer, or any other dayman sees a steel tie or two in a part of the mine which is not in use the natural thing for him to do is to pick this tie up and bring it out as the work is trifling, whereas had it been a wood tie, he would probably intend to come back and get it or send back for it some other time, which time would probably never come.

Track Extension

One of the chief values of the steel tie lies in the fact that its use has made possible the most satisfactory meth-



Steel Tie with Exterior Reversed Jumper Rail

or of advancing the jumper rail that has ever been developed. I find that by turning the "jumper" upside down, right over the track rail which has already been laid, but on the outside of it, thus leaving the base of the jumper up instead of the ball, that the jumper will lie right over the track rail and extend past it, thus allowing the miner to keep his mine car right up to his coal all the time.

A regular wooden wedge will hold this jumper in place just as it will the rails in the track. The miner then to extend his jumper has only to loosen this wooden wedge and pull the jumper rail forward the required length. When the full length of the jumper is used in this way the miner simply turns it over and wedges it up, making it a part of his road track. We do not make special wood wedges for this work but use cap pieces and no tools at all are necessary as these wedges can be driven in with a piece of slate if no tools are at hand.

When taking up bottom slate for the roadway where we use wood ties which are 5 ft. long, we have to remove material about 6 ft. in width, but when using steel ties that width can be reduced to four feet. This difference is strongly in favor of the steel ties; moreover, that type of tie takes up not more than ½ in. of height, while the wood ties take up 4 in. We have just 3½ in. less slate to handle to get the same height over our mine car.

The Economy Ratio Three to One

Fred Norman, chief engineer of the Allegheny River Mining Co., Kittanning, Penn., makes the following statement relative to steel mine ties: The length of time during which the steel tie has been in use in our mines is not sufficient to permit me to certify to its durability, but it appears that a steel tie would last as long as six wooden ties and half as many of these more expensive ties are required to lay the same length of track as is necessary when wooden ties are used. The ratio of utility is, therefore, as 1 to 12.

We pay 32c. plus freight for our steel ties and the wooden tie costs us 8c. delivered. Overlooking the freight charge, which is not considerable, the ratio of costs is as one to four in favor of the wood tie. Hence it is easy to see that it is three times as profitable to use a steel tie as one made of wood. This estimate does not take into consideration the fact that there is a saving in spikes and a saving in tie waste because the miner takes more care to save steel ties than he will to recover wooden ones. Moreover, steel ties are not suitable as substitutes for props and the wooden ties are very often used for this purpose replacing material which might be purchased much more cheaply.

Convenience in Laying Tracks

There is also much saving in the laying of tracks. As it is easy to relay a road in an abandoned room or along a coal pillar with the use of these steel ties, the miner often does the work himself rather than wait for the tracklayer to do it for him. Under the old system in which wood ties were used he would sit down and wait patiently, or impatiently as the case might be, and have the tracklayer lay his track.

There is also a considerable saving in brushing rooms in low coal where a few inches would have to be removed either in the top or bottom in order to permit the passage of the car, and we can lay the track with the top of the rail four inches lower than on wooden ties unless the wood ties are sunk down into the floor which has to be paid for when done. Steel ties sink readily into the clay so that the base of the rail rests on top of the floor.

In other cases where it is not necessary to lower the rail for the passage of the car it is an advantage to have a thin tie because we can get a topping of four inches of coal on each car in excess of what could be loaded if a wooden tie were used. This amounts to about 10 per cent. more coal per car.

Miners are more careful to remove steel ties where drawing pillars than they would be were wooden ties provided. Miners prefer the steel tie as it is less work

West Virginia Coal Mining Institute

SYNOPSIS—Following a two-day program, which included the reading of several interesting technical papers, automobile trips to nearby industrial plants and a banquet, the members made an all-day inspection tour of mining and coking plants in the famous Connellsville region.

The summer meeting of the West Virginia Coal Mining Institute convened in Morgantown, Tuesday morning, June 24. Following addresses of welcome by Mayor Stewart and Prof. C. R. Jones, of the State University, came the presidential address of Neil Robinson. After President Robinson had finished his interesting and instructive talk, a paper on "Gasoline Motor Haulage in Mines," was read by R. O. Hodges, mechanical engineer of the George D. Whitcomb Co., Rochelle, Ill. This lengthy discussion on gasoline locomotives will be published in COAL AGE, probably next week.

In the afternoon of the opening day of the convention, the members and friends of the Institute boarded special cars and were taken to Sabraton, where they inspected the works of the American Sheet & Tin Plate Co., and the Pressed Prism Plate Glass Co. Returning to Morgantown at 4 o'clock in the afternoon, the Institute members were taken in automobiles for an extensive ride to the plant of the Hydro-Electric Co. of West Virginia, on Cheat River, and from there to Mt. Chateau, where a luncheon was served.

On Wednesday morning, President Robinson having been called away, George T. Watson, vice-president of the Institute, presided. The following papers were read: "Welfare Work in Mining Communities," by Ira D. Shaw, secretary Central Y. M. C. A., Pittsburgh, Penn.; "The Hess Dustless Mining Machine," by Raleigh C. Taylor, secretary Hess Dustless Mining Machine Co., Ansted, W. Va.; both of these papers are printed elsewhere in this issue.

On Wednesday afternoon, J. Clark Evans, secretary of the Fairmont Mining Machine Co., Fairmont, W. Va., read an interesting paper on "The Uses of Steel Ties in Mining." Following Mr. Evans' address came a talk on "The Power Development on the Cheat River, at Cheat Haven," by George F. Rowell, engineer-in-charge, Cheat Haven, Penn.

The members of the Institute attended a banquet at the Madeira Hotel, Wednesday evening. Short after-dinner talks were given by H. M. Wilson, engineer-in-charge, Bureau of Mines, Pittsburgh, Penn.; Dr. T. E. Hodges, president West Virginia University; Floyd W. Parsons, editor COAL AGE; J. B. Hanford, general superintendent Elkins Coal & Coke Co.; E. B. Wilson, editor *Colliery Engineer;* J. B. Johnston, editor *Coal and Coke Operator;* and E. N. Zern, professor of mining, West Virginia University. Dr. I. C. White, of Morgantown, acted as toastmaster.

On Thursday morning, at 7 o'clock, the Institute members left Morgantown via the B. & O. R.R., for an all-day trip to various modern mining and coking plants in the Connellsville region. Mines of the W. J. Rainey Co., the H. C. Frick Coke Co., and the Oliver & Snyder Steel Co., were inspected. The meeting as a whole was interesting and instructive, although the attendance was not as large as it has been at other recent meetings of the West Virginia Institute.

The Use of Steel Ties in Mining

BY J. CLARK EVANS*

SYNOPSIS—The steel mine tie has not only greater durability than its wood rival, but has the advantage of taking up less room so that in low places either less brushing is required or else the cars can be more fully loaded. The many advantages of steel mine ties in beds of coal of all kinds are here summarized.

The scarcity of timber, among other reasons, has caused the introduction of the steel tie into mining, but that has not been the sole reason for its development. Many operators have realized that the wood tie has several disadvantages, such as excessive cost of handling, short life, and height of track above room floor. At first every operator who used steel ties had a special design of his own, and none were manufactured or used extensively.

It has been only within the past four years that steel mine ties have been put on the market and pushed by manufacturers in this country and the strides this product has made are remarkable. Mines that a few years ago were using a hundred at a time are now ordering them by the car load. I have collected a few statements from mining men relative to the availability of steel ties for use in mining, and I feel that I can do no better than to quote some of these.

RELATIVE FIRST COSTS

C. H. Meade, the general manager of the Peytona Block Coal Co., Peytona, W. Va., states: For laying one pair of rails we use four steel mine ties which cost us 32c. each, or $1.28 per pair of rails. When laying the same length of track with wood ties, we place them at three-foot centers and so have to use 11 cross ties at a cost of 5c. each, or $0.55 per pair of rails. We also use spikes costing about 10c., making the cost for material 65c. as against $1.28 for material where steel ties are used.

To offset this greater cost for material, however, we find that there is a large difference in the labor required to lay the pairs of rails, using the two different methods of keeping them in gage. At most mines, the miners do not object to laying the tracks in their working places themselves if steel ties are used as they can lay them without any tools, but they demand that wood ties shall be placed

*Secretary Fairmont Mining Machinery Co., Fairmont, W. Va.

Note—Paper read before the West Virginia Coal Mining Institute, June 25, 1913, at Morgantown, W. Va.

for them by a track layer. Moreover they can lay the rails and be loading coal in the time they would be waiting for a tracklayer to reach their places. The difference of cost in laying (63c.) is practically absorbed by the time demanded to gather up the necessary wood ties and haul them to the working place, and to pay a track layer to go to the room and lay the rail.

First Cost of Both Ties Really Equal

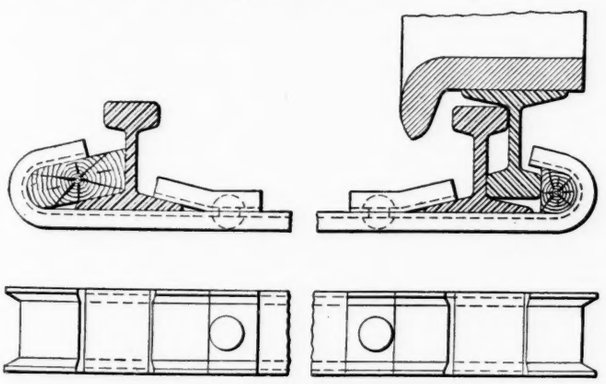
Therefore, I regard the original cost of one pair of rails laid with steel ties and one pair laid with wood ties as practically the same. My experience has been that wood ties are very seldom used more than twice. I have not been using steel ties long enough to make an estimate as to how many times they may be used, but it would certainly take a long time to wear them out.

We find that we recover a much greater number of ties made of steel than we do when they are made of wood. If the top gets bad in a working place it only takes a few minutes' labor to tear up and remove the track if laid with steel ties, and the miner can do this work when to spend the longer time required to remove a track laid with wood ties would be dangerous.

Moreover, if a mine foreman, tracklayer, or any other dayman sees a steel tie or two in a part of the mine which is not in use the natural thing for him to do is to pick this tie up and bring it out as the work is trifling, whereas had it been a wood tie, he would probably intend to come back and get it or send back for it some other time, which time would probably never come.

Track Extension

One of the chief values of the steel tie lies in the fact that its use has made possible the most satisfactory meth-



Steel Tie with Exterior Reversed Jumper Rail

or of advancing the jumper rail that has ever been developed. I find that by turning the "jumper" upside down, right over the track rail which has already been laid, but on the outside of it, thus leaving the base of the jumper up instead of the ball, that the jumper will lie right over the track rail and extend past it, thus allowing the miner to keep his mine car right up to his coal all the time.

A regular wooden wedge will hold this jumper in place just as it will the rails in the track. The miner then to extend his jumper has only to loosen this wooden wedge and pull the jumper rail forward the required length. When the full length of the jumper is used in this way the miner simply turns it over and wedges it up, making it a part of his road track. We do not make special wood wedges for this work but use cap pieces and no tools at all are necessary as these wedges can be driven in with a piece of slate if no tools are at hand.

When taking up bottom slate for the roadway where we use wood ties which are 5 ft. long, we have to remove material about 6 ft. in width, but when using steel ties that width can be reduced to four feet. This difference is strongly in favor of the steel ties; moreover, that type of tie takes up not more than ½ in. of height, while the wood ties take up 4 in. We have just 3½ in. less slate to handle to get the same height over our mine car.

The Economy Ratio Three to One

Fred Norman, chief engineer of the Allegheny River Mining Co., Kittanning, Penn., makes the following statement relative to steel mine ties: The length of time during which the steel tie has been in use in our mines is not sufficient to permit me to certify to its durability, but it appears that a steel tie would last as long as six wooden ties and half as many of these more expensive ties are required to lay the same length of track as is necessary when wooden ties are used. The ratio of utility is, therefore, as 1 to 12.

We pay 32c. plus freight for our steel ties and the wooden tie costs us 8c. delivered. Overlooking the freight charge, which is not considerable, the ratio of costs is as one to four in favor of the wood tie. Hence it is easy to see that it is three times as profitable to use a steel tie as one made of wood. This estimate does not take into consideration the fact that there is a saving in spikes and a saving in tie waste because the miner takes more care to save steel ties than he will to recover wooden ones. Moreover, steel ties are not suitable as substitutes for props and the wooden ties are very often used for this purpose replacing material which might be purchased much more cheaply.

Convenience in Laying Tracks

There is also much saving in the laying of tracks. As it is easy to relay a road in an abandoned room or along a coal pillar with the use of these steel ties, the miner often does the work himself rather than wait for the tracklayer to do it for him. Under the old system in which wood ties were used he would sit down and wait patiently, or impatiently as the case might be, and have the tracklayer lay his track.

There is also a considerable saving in brushing rooms in low coal where a few inches would have to be removed either in the top or bottom in order to permit the passage of the car, and we can lay the track with the top of the rail four inches lower than on wooden ties unless the wood ties are sunk down into the floor which has to be paid for when done. Steel ties sink readily into the clay so that the base of the rail rests on top of the floor.

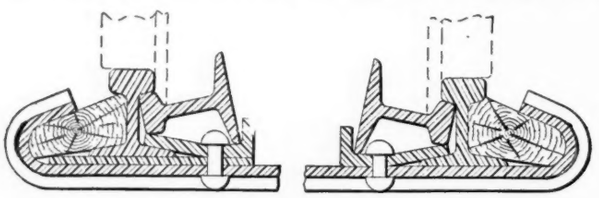
In other cases where it is not necessary to lower the rail for the passage of the car it is an advantage to have a thin tie because we can get a topping of four inches of coal on each car in excess of what could be loaded if a wooden tie were used. This amounts to about 10 per cent. more coal per car.

Miners are more careful to remove steel ties where drawing pillars than they would be were wooden ties provided. Miners prefer the steel tie as it is less work

to lay the track with them; they are easier and lighter to handle, and spikes are not needed. It is sometimes hard to get these spikes from the trackman who is not desirous of giving the men any more than they absolutely need, because he fears that if he is too liberal he will not have enough for himself and large quantities will be wasted.

Better Room Tracks

As the ties sink into the bottom and leave the base of the rail resting firmly on the slate there is a more stable track for the car with less bending of the rails. The additional height permits better loading with less difficulties.



Steel Tie with Interior Jumper Rail Used as Channel Track

The stability of the track makes it easier for the miner to handle his cars where he has to push them in and out of his rooms. If a car leaves the track it is generally not so badly distorted when a steel tie is used and it is a great deal easier to get the car or cars retracked when there is a lift of only about two inches to replace the car as against six inches with wooden ties.

We find that track laid with steel ties in rooms gives excellent satisfaction with electric-gathering motor haulage and consider that we are saving many wrecks or derailments when gathering with locomotives because the track is laid solid on the floor.

This company has its own mills and is manufacturing timber and the wood ties are cut from odds and ends which will not make marketable lumber, but the steel tie has so many points in its favor that we find it more profitable to make them than to buy our own wood ties.

Four Steel Ties to a Pair of Rails

Lee Ott, general superintendent, Davis Coal & Coke Co., sends reports from two of his superintendents at mines where steel ties are being used. The first letter, from W. W. Brewer, superintendent of the Dartmore mine, reads: Steel mine ties have been used in the Dartmore mine for the past seven months. We use four steel ties under a 30-ft. rail, one at each end and two at equal distances apart in the middle. As the ties cost 32c. each, $1.28 is the total material cost of laying a track 30 ft. long. No spikes, bolts, splice bars nor the service of the trackman are required.

If wood ties were used for the same distance, placing them three feet apart, it would take 10 ties at 10c. per tie, making $1 plus 12c. for spikes. Thus the cost would be $1.12, making a difference of 16c. more for the steel ties. The cost would figure the same in proportion for a longer track, that is, about ½c. per foot more where steel ties are used.

If wood ties were adopted an additional expense would be added for we would be compelled to send a trackman to help many of the miners with their tracks. There are many miners who cannot lay a good track.

Use in Pillar Work

Miners would have to be supplied with track tools especially on pillar work to tear up the track; short rails would have to be supplied for each place and the miner would lose much time in tearing up and relaying the rails.

Steel ties are convenient in pillar work; the last rails at the face of a pillar are turned upside down and the top of the rail slipped from the outside groove of the tie in place of the wedge, and as the pillar is drawn back the rails are slid in the outside of the other rails until the full rail length is used up. It requires practically no time or effort on the part of the miner. With the wood tie the men would be running from place to place, hunting spikes and hammers and we would lose tonnage, especially on a day when men were scarce.

I believe the steel tie would work successfully on a heading if splice bars were used on the rails with the heavier ties. I feel sure they would hold the track under a heavy load. The rails cannot get out of gage or turn and after the track was run over for a time it would become stationary and not work sideways.

M. H. Harrison, superintendent of mines 14 and 20, writes: The steel mine tie saves shooting the rock to obtain height in the rooms of our mines and so saves a dollar per yard. Allowing one tie for every yard of rock, which we would be obliged under ordinary conditions of working to shoot, we have a saving of 63c. per yard on the initial cost and have the tie to use elsewhere for the same purpose as it is practically indestructible. In this way these ties are a great boon to the operators of mines in thin coal.

When the Moores Run Coal Co., which owned the Kirkwood mine, near Bridgeport, Ohio (now operated by the Hutchinson Coal Co.), equipped that mine with steel rails and ties they collected data showing the economy effected.

YEAR 1907—ALL WOOD TRACK

Month	Tons produced	Cost per ton
September	16043	$0.0480
October	26216	0.0402
November	22617	0.0370
Average cost per ton		0.0410

YEAR 1908—75% STEEL TRACK

Month	Tons produced	Cost per ton
September	12620	$0.0398
October	16696	0.0336
November	16281	0.0321
Average cost per ton		0.0348

YEAR 1909—ALL STEEL TRACK

Month	Tons produced	Cost per ton
September	21556	$0.0284
October	22540	0.0281
November	25191	0.0282
Average cost per ton		0.0282
Saving per ton in favor of ALL STEEL TRACK		$0.0128
Saving for three months of 1909		$886.85
Saving per room measuring 24 ft. x 200 ft. and producing 1000 tons; coal 5 ft. 4 in.		12.80

The following comparison of cost of removing the coal from a room 24 ft. wide, 200 ft. long, 5 ft. 4 in. thick, by the use of steel rails with wood ties, and steel rails with steel ties was also made at the same time.

Wood Ties		Steel Ties	
Ties 2½ ft. apart, 80 ties at 12c.	$9.60	35 Ties at 33 cts.	$11.55
320 spikes, 40 lb.	0.90	Labor removing track	1.50
Labor laying and removing track	7.50	(Track laid by miners)	
Depreciation of ties and spikes.	3.50	Depreciation	1.00
Total	$21.50	Total	$14.05
Value of material left	7.00	Value of Material left	10.55
Actual cost	$14.50	Actual cost	$3.50

Saving per 1,000 tons $11.00 or $0.011 per ton.

A Coal Cutter with Saw and Auger Movement

By Raleigh C. Taylor*

SYNOPSIS—In this new mining machine, the bits are arranged spirally on a cone-shaped cutter. As they revolve, they grip the coal after the manner of an auger. A quick reciprocation serves to break the coal which they have gripped and prepare the surface for further cutting action. It belongs to the type of shortwall machines.

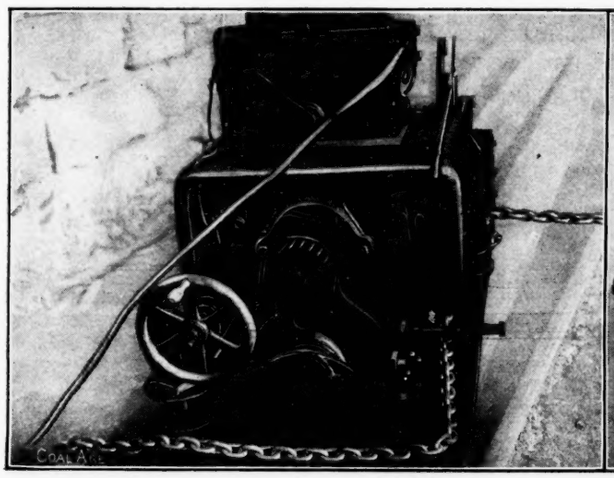
The Hess dustless mining machine is the invention of Louis F. Hess, who was born near Ansted, in Fayette County, W. Va., in the year 1862, and has remained there practically all his life, now living on the old homestead where he was born. His grandfather came to Nicholas County, W. Va., from Massachusetts, in 1816 or 1817, and perhaps it was from this Yankee ancestor that he inherited the ingenuity that enabled him to design his coal cutter.

The inventor has been at work in and around the coal mines of Fayette County, for about 33 years, and thinks he has mined with his own pick his full share of coal. From mining he was promoted to mine foreman, and then superintendent, so that he has filled almost every position connected with his line of work.

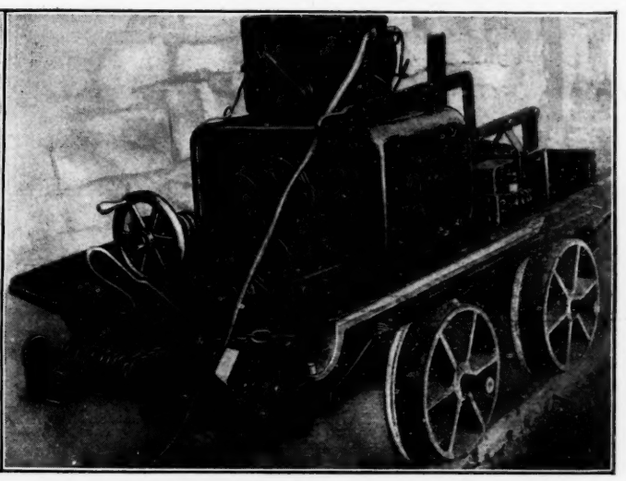
Evolution of the Machine

About 1896 he was in charge of two mines for W. P. Rend, the well-known coal operator of Ohio and West Virginia. Here, for the first time, he was in charge of mining machines, and they gave him so much trouble in various ways that he determined to build a cutter of better design. From that time to this he has been experimenting and working out his plans as spare time and means would allow. After several experiments, he finally worked out a satisfactory cutter bar and contrived the means for giving it a reciprocating as well as a revolving motion.

Shortly after this, in 1911, he built, partly at home and partly at the machine shop of the Gauley Mountain Coal Co., his first power-driven machine. To demonstrate his idea, he mounted the motor and shaft with cutter bar attached on a wooden frame, and with this contrivance proved to everyone who saw the resultant machine in operation that he was working on the correct principle. Then arrangements were made with the same company to build a machine of suitable materials and of substantial construction. At this point proper credit should be given to E. L. Morris, of Ansted, whose mechanical skill, good judgment and patience have been invaluable to Mr. Hess in working out all the necessary details.



Machine Rigged for Cutting across Face



Small Truck Conveys Cutter between Rooms

Finally, the first machine was completed and made the remarkable record of cutting a room the first time it was taken into the mine, and did it with little trouble; though, of course, many changes of detail and improvements suggested themselves.

Machine Bores and Saws Its Way through Coal

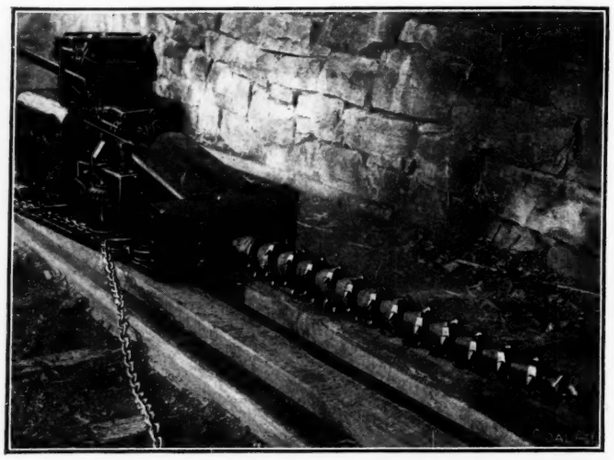
The Hess machine is of the revolving cutter-bar type and in operation combines the two methods that have long been regarded as the best for cutting coal, viz.: boring and sawing. The construction is strong and simple. On a substantial bed plate, shaft bearings are mounted at such an inclination from the horizontal as to hold the main shaft true with the center line of the cone-shaped cutter bar when that cutter is lying with its lower surface in the same plane with the bottom of the bed plate. The main shaft is surmounted by the motor, so that the armature pinion engages the gear on the rear end of the shaft, the ratio of their diameters being 3:1, giving a speed of 300 r.p.m. to the cutter bar.

The reciprocating motion is derived from a worm, affixed to and revolving with the main shaft; but the latter is free to slide backward and forward through it. On

Note—Article entitled "The Hess Dustless Mining Machine" read at the West Virginia Coal Mining Institute, Morgantown, W. Va., June 25, 1913. This machine was described and illustrated in a somewhat briefer manner in our issue of Dec. 28, 1912, Vol. II, p. 914.

*Secretary, Hess Dustless Mining Machine Co., Ansted, W. Va.

a cross shaft immediately over the worm is mounted a worm wheel and two crank disks, which are also gear wheels. The worm wheel, of course, engages the worm on the main shaft with which its ratio is 1 to 15, giving the cross shaft a speed of 20 r.p.m. Rods connect the crank disks with a slide bearing on the forward end of the main shaft; in this bearing the main shaft is free to turn, but is held fast longitudinally by means of collars. The slide bearing being connected with rods to the crank disks on the cross shaft, is so moved backward and forward, and imparts the reciprocating motion to the main shaft and cutter bar. Engaging the teeth on the crank disks are two pinions mounted on a second cross shaft, which drives the feed mechanism.



A View Taken in Open Air; Machine Rigged to Commence Cut

The Saw Auger

The cutter bar is a spiraled, cone-shaped, steel casting, about 5 ft. long, 7 in. in diameter at the butt, and 3 in. at the tip. Along the spiral rib of this casting are set bits or picks of tool steel, so spaced as to give one bit to each inch of cross-section of the bar; and as the reciprocating motion of the bar covers a space of three inches, the space between the bits is well taken care of. A triangular center bit is set in the tip end of the bar. The bar is screwed to the end of the main shaft, so that they have a common center line, and this brings the bits into such a position as to make them revolve barely clear of the floor, and parallel with it when at the lowest point of a revolution.

The bed plate and casing, which contains all of the mechanism except the cutter bar, is 5 ft. long and 2 ft. wide; with the controller placed on top, the height is about 28 in., but this may be reduced to about 20 in. by placing the controller on the side of the motor.

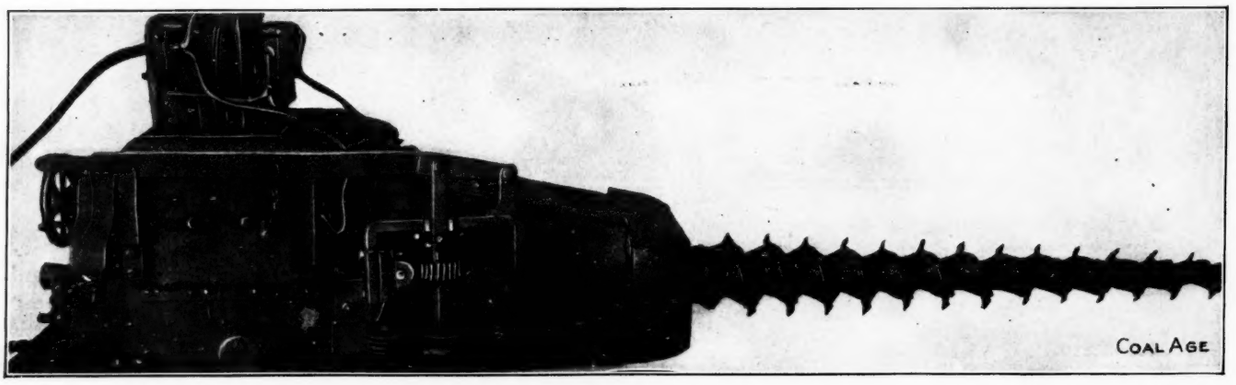
With the cutter bar attached, the machine weighs 2350 lb., the cutter bar itself weighing about 200 lb., as it is detached when moving from place to place, the greatest weight to be handled in one piece is 2150 lb.; the truck weighs 620 lb., and the box of fittings 560 lb., so that the total shipping weight is about 1.7 tons.

At present, a 23-hp. motor is being used, and it has given a surplus of power under all conditions so far encountered; if, however, it is necessary where the coal is of a harder nature, to use more power, or to strengthen the machine as a whole, this can readily be done without changing the general lines or plans materially.

Method of Cutting

In operation, the cutter bar is holed for its full depth in the left-hand corner of the room, in such a manner as to make practically a straight rib, the chain and jacks are then arranged so as to draw the machine across the face from left to right, sliding on the bottom, making a continuous undercut 5 ft. deep, 8 in. high at the front end and 3 in. high at the back, and flush with the floor, so that no scraping is necessary.

A double chain is used for holing in and for feeding across the face. For the latter operation the chain engages the drive sheave *B* on the machine and is then passed around a roller on the jack *A* in the right-hand corner of the room, after which the end is brought back to the machine and fastened to the forward right-hand corner *G* of the carriage. The rear end of the chain passes around the rear of the machine by pulleys *F* and *E*, then around a roller *H* on a jack set near the left rib, and is engaged in the chain sheave on the staff of the hand-steering gear *E*. By means of this hand-steering gear, the chain is kept tight and the rear of the machine may be retarded when necessary, in order that it may be held approximately at right angles to the face.



Side View of Hess Dustless Mining Machine

Rate of Operation

The rate of feed is regulated to suit the coal in which the work is being done. The highest speed (across the face) that has been tried is 36 in. per minute and the lowest 13 in. This means a maximum of 15 and a minimum of 5 sq.ft. per minute undercut. The operation of unloading, loading, moving to any desired position, and

propelling the truck, are performed quickly and easily by the machine under its own power, so that very little manual labor is necessary.

The amount of work that can be done in a given time will, of course, depend upon local conditions and the way in which the machine is handled, but records that have been made justify the claim that no other machine will do as much work in the same time under similar conditions, and with the same power.

Some of the advantages claimed are as follows:

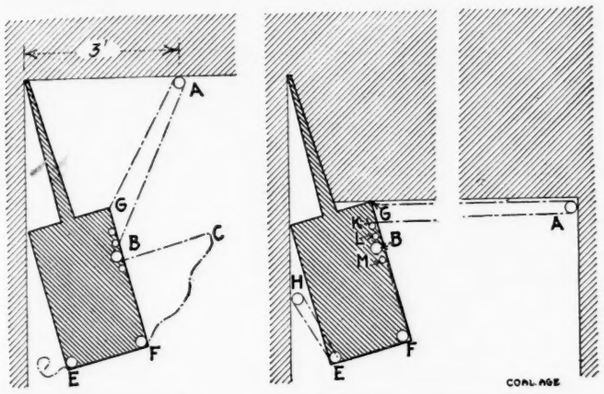
1. Dustlessness. As the cuttings are not pulverized, and rather coarse, little or no dust is made.

2. Safety to machine men. There is very slight chance of injury to the workman.

3. Props may be set within six feet of the face without interference with undercutting.

4. The machine produces more coal per keg of powder than any other machine which uses electric power direct because it makes a tapered cut.

5. The cut removes the coal down to the floor, leaving a perfectly smooth bottom.



HOLING IN CUTTING ACROSS FACE

6. A greater quantity of coal can be undercut with this than with any other machine in a given length of time and under similar conditions.

7. Owing to simplicity and strength of construction, repairs are reduced to a minimum.

8. Power consumption is comparatively small.

9. Owing to its lightness, and the fact that it is practically self-handling, manual labor is easier with this than with any other mining machine.

10. The machine is readily adjusted to irregularities in the floor both longitudinal and transverse.

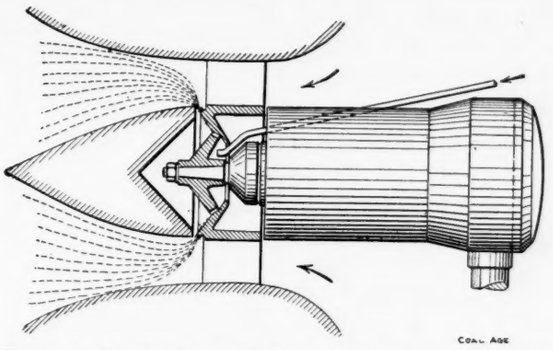
The dustless feature of the cutter has been unanimously conceded by a number of expert mining men from all over the country, who have seen it in actual operation. The importance of this point cannot be overestimated in view of the stress that is being placed on the prevention of dust in coal mines and the great danger arising from this cause.

The suppression of dust, careful timbering and the prevention of solid or heavy shooting, are the three items receiving most attention and provoking most discussion at present. The Hess machine tends to eliminate the most fruitful cause of dust, allows timber to be set close to the face and makes a tapered cut, and in this way meets the safety requirements in coal mining.

The other points of advantage claimed are those of efficiency, economy and convenience. The tremendous saving of power, arising from the substitution of electricity for compressed air, will be readily admitted without taking into consideration the trouble, inconvenience and expense of maintaining pipe lines. The advantages of the tapered cut and the desirability of applying electric power direct to it are also clear, and an examination of the machine in detail will be convincing as to its simplicity and strength of construction and economy of maintenance.

A New Atomizer

Several effective spraying devices have been invented and sold, but most of these consist solely of a suitable form of nozzle, by which the water is split up into finely divided particles, capable of washing down any suspended coal dust in the air. The difficulty, however, with regard to such sprayers is that in order to secure fine division of the water, the aperture of the nozzles is necessarily very small, with the result that they often become clogged by the dirt contained in the water. To meet this difficulty, either pure water must be obtained or dirty water made suitable by straining.



A SIMPLE ATOMIZER FOR PRECIPITATING COAL DUST

If the fineness of the spray could be obtained by the use of infinitesimal orifices, some impurity in the water used, would not be objectionable.

A type of sprayer has been introduced by Gustav Schlick, of Dresden, which does not depend on the use of nozzles, but on the action of a disk revolving at a high peripheral speed. It is, therefore, somewhat similar in construction to that devised by H. H. Clark, of the Bureau of Mines. The construction of this type of atomizer is shown in the illustration. The disk, by its rapid revolution, throws the water introduced to it, tangentially from its outer edge with a high velocity, and the water is in this way forced out in fine stream lines in the form of a spray. These stream lines are uniformly distributed throughout a wide area by means of suitably shaped expanding surfaces, leading to the outlet of the sprayer.

By this means, considerable volumes of water can be dealt with by a comparatively compact apparatus suitable for use in the most constricted workings. Impure and pit water can, if necessary, be used without any fear of clogging, the amount of water atomized can be varied by changing the speed of rotation and the supply of water to the sprayer. In order to procure a high-speed of rotation, the disk can be speeded to 12,000 r.p.m. It is rotated either by means of an electric motor, belt-connected to the apparatus, or directly by means of a steam or compressed air-driven turbine.

A Review of the West Virginia Inquiry

SYNOPSIS—The investigation of the West Virginia mine strike was conducted in such a manner that the statements of the operators were delivered last and in a series of hearings which exhausted the reporters. Thus the record of the newspapers favored the miners' cause. The following is a presentation of the results of the inquiry from the operators' point of view.

The correspondents who covered the Senate subcommittee's investigation into mining conditions in this state, had to send their reports "running." Many sensational statements thus got on the wire which were shown on cross-examination to be untrue; but the original statements were not modified, for lack of time, rather than from any intent or desire to misrepresent, for the hearing was a continuous performance broken only by short intervals for food and sleep. All this being true, it may be worth while to review the hearing as a whole, in order to get all parts of the evidence into their proper relation to each other and in due perspective.

Briefly summarizing the results of the first installment of the hearing, these facts seem to have been clearly established by a preponderance of evidence:

1. The alleged fundamental grievance of the miners, namely, the employment of Baldwin-Felts guards was shown to be unfounded, because no guards were employed on the north side of the Kanawha and on Paint Creek, where the reign of violence began until after a number of crimes had been committed by striking miners. On Cabin Creek but four guards were employed. These were men of good character, who had lived on Cabin Creek for years and who were on friendly terms with the miners.

Attitude of Operators to Union

2. The real cause of the disturbance was the attempt by the United Mine Workers to force the operators to concede the "check off," which, if granted, would have resulted in the compulsory unionization of all the mines. The operators did not oppose the union any further than to insist on the open shop. Failing to obtain the check off, the miners struck for an advance of 2½c. a ton, as prescribed at the Cleveland conference of operators and union officials of Indiana, Illinois, Ohio and western Pennsylvania. The advance was granted on the north side of the Kanawha, but was refused by the Paint Creek Collieries Co., the entire output of which, for a series of years, had been sold at a price which did not admit of an advance in wages. The Paint Creek Collieries Co. was then, and still is, insolvent. After receiving what they had asked, the miners on the north side of the Kanawha, being incited by the person known as Mary Harris, alias "Mother" Jones, stenographic reports of whose profane, vulgar and incendiary speeches were offered in evidence, and others bought rifles and thus armed, went over to Paint Creek where they joined the strikers and in cooperation with them, committed many acts of violence. Not until all this had occurred were any mine guards employed on Paint Creek, and only then were the guards on Cabin Creek reinforced.

The Courts Were Unable To Repress Disorder

3. Many crimes were committed, for which no one has ever yet been indicted or punished; for the courts, while nominally open, were actually powerless to administer justice. Bodies of strikers, armed with rifles, openly paraded in Charleston and elsewhere or skulked in the woods around the mining camps, firing into houses and at men, women and children. Governor Glasscock thereupon declared martial law. The militia found "more than a thousand" armed strikers in the field confronted by 110 mine guards. The governor and the military authorities held that an insurrection actually existed. This view was shared by law-abiding citizens, and it has since been confirmed by the dictum of the State Supreme Court. Notwithstanding all this, the first act of the militia was to disarm the guards and send them out of the disturbed district. Then, finding that guards were absolutely necessary, even union officers conceded this, the governor, after confering with union officials and with their approval, put into effect a plan for selecting guards to be known as "watchmen" from the militia. "Watchmen" were as violently denounced as the guards had been and the disorders increased.

Wages Were Adequate, Commissary Prices Fair

4. The alleged secondary grievances of the miners were baseless. Numerous witnesses, even including many summoned on behalf of the miners, testified under oath that all who wanted to work could make good wages, but that many would not work. One witness swore his earnings ranged from $100 to $150 a month, and that three times he had earned as high as $190 a month. Others swore that they had earned good wages for years. Witnesses in behalf of the miners testified that the schools were as good as any in Kanawha County, but that many families neglected to send their children to school. The preponderance of evidence showed that in instances where company-store prices were higher than in independent stores, the goods were of superior quality. An interesting sidelight on the company store and its patrons was afforded in a statement submitted by President Connell, of the insolvent Paint Creek Collieries Co., showing that in the last year the company's stores had to write off $12,000 in bad accounts. Company houses, water supply and sanitary conditions were satisfactory.

The Train of Death

5. The "death train" story was related by a witness who admitted that he was a "free lance," ready for any job. He stated that he worked for a few days as a guard, was then discharged and has ever since been a union adherent without visible means of support. His story was published without qualification or reservation by newspapers throughout the land, and the operators were consequently represented as being worse than the Commanches of former days.

But note how different the story seems when all the facts are told: Three different men at Mucklow, which village had been shot up on several previous occasions, telephoned to Quinn Morton and Sheriff Hill in Charleston, Feb. 7, that the town had been attacked again. They

appealed for rifles and for reinforcements. The Charleston & Ohio R.R. sent a special train for Sheriff Hill's posse of 11 men. This included the armored car which the company had equipped to protect its property. On the way, Sheriff Hill was warned that the miners at Holly Grove had planned to attack the train. As a measure of common prudence, the brakeman turned out the lights. Near Holly Grove, they saw a large number of women and children gathered in front of a cabin watching the train. Those on board concluded that the miners had sent their women and children to a safe place preparatory to an attack. As a matter of fact, this is exactly what had happened. Thus it seems that the train did not fire on a camp full of women and children as has been alleged, but only at an ambushed enemy. On reaching Holly Grove, the train was fired upon and replied. In the pitched battle that ensued, one man was killed and one woman who had refused to leave her husband was wounded. Every window in the train was shattered. The witness whose outrageous yarn had been sent broadcast has since been discredited.

6. "The present constitution of the United Mine Workers of America does not present the most inviting inducements to the operators to enter into contractual relations with it," declared the anthracite coal-strike commission appointed by President Roosevelt to settle the anthracite strike of 1902. W. L. Connell, president of the Paint Creek Colliery, who for nine years has been chairman of the Board of Conciliation, appointed pursuant to the recommendation of the Anthracite Strike Commission, and who is an anthracite operator, said in response to a question by counsel for the miners:

"If it was the purpose of the operators of West Virginia to destroy the union, my experience in the last year has almost persuaded me that their judgment was correct. I have received the most scant courtesy from the officers of District 17 of the United Mine Workers that I have received in all the 21 years I have been an employer of labor."

An Instrument for Measuring the Flow of Air or Gas

The accompanying illustration shows an instrument for the accurate measurement of the flow of air or gas in a pipe. As may be clearly seen, it is a Pitot tube attached to a differential monometer.

The monometer, which is by no means a new invention, consists of a hollow brass cylinder or well around the outside of which is wound upon a uniform inclination, a transparent celluloid tube. The whole apparatus is arranged so that it may be rotated about its axis and the height of the liquid in the tube be thus easily ascertained.

As may be seen, the part of the instrument within the pipe is a Pitot tube in the simplest form. To obtain the average velocity of the flow in the pipe the impact nozzle of the tube should be placed approximately $\frac{7}{10}$ of the distance from the center of the pipe to its inner circumference. The radial position of the static nozzle is immaterial.

The dynamic nozzle is connected with and transmits pressure to the liquid within the hollow cylinder, while the static nozzle performs a like service to that which is in the coiled celluloid pipe. This pipe, by the way, is connected to the cylinder near the bottom.

Suppose that the liquid in the coiled tube is brought to the zero marking upon the cylinder, when the cock in the yoke is closed, and consequently no pressure or rather an equal pressure is exerted upon the surface of the liquid in both the brass cylinder and coiled tube.

When the cock is opened the pressure of the moving gas due to its velocity is transmitted to the inside of the cylinder, while its static pressure is transmitted to the surface of the liquid in the coiled tube. As these two pressures are unequal, the liquid rises a certain amount in the coiled tube, this amount depending upon the velocity of the gas in the pipe.

When the instrument is set up as above described,

CROSS-SECTION OF PIPE WITH PITOMETER IN POSITION

the average velocity existing in the pipe may be determined from the formula: $v = \sqrt{2gh}$. Where v equals the velocity of the gas in feet per second, g equals the acceleration due to gravity and h equals the head in feet causing the flow.

Since h in the above formula is a head of gas in feet but is measured by h_1, which is the head of liquid (usually either water, oil or mercury) it is necessary to know not only the density or weight per cubic foot of the gas flowing in the pipe, but also the specific gravity of the liquid by which this head h is measured.

Both these quantities are either known or may be readily calculated and letting V represent the velocity of flow in feet per minute and reducing our formula to its simplest form, it becomes $V = k\sqrt{h_1}$. Where k is a constant depending upon the density of the gas whose flow is being measured, and the specific gravity of the liquid employed.

As above described, this instrument is suitable only for measuring the flow of air or gas in a pipe. There is no good reason, however, why it could not be mounted in a fan house in such a manner as to show the velocity, capacity and horsepower being developed by the fan.

Rocky Mountain Coal Mining Institute

EDITORIAL CORRESPONDENCE

SYNOPSIS--An account of the second semiannual meeting of the Rocky Mountain Coal Mining Institute which was held at Salt Lake City, Utah, on June 11, 12 and 13, 1913.

The second semiannual meeting of the Rocky Mountain Coal Mining Institute was held at Salt Lake City, Utah, on June 11, 12 and 13, 1913. Previously 146 members and friends had left Denver on Monday, June 9, on a special train over the Union Pacific R.R., making stops at Superior, Wyo., and also at Rock Springs and Reliance, in order to inspect the plants of the Union Pacific Coal Company.

At Superior the visitors saw the unusual arrangement where the hoist is carried upon the headframe, being located directly over the opening, and the hoisting engineer stationed in the room where the weighing and dumping is done. At Reliance an endless-rope car haul was the principal feature, while at Rock Springs a demonstration of first-aid work was given. The special train left Rock Springs at 11:30 p.m., on the 10th and arrived at Salt Lake City 7 a.m., the following morning.

The regular meeting of the institute was called to order on Wednesday morning, June 11, at 10 a.m., by the president, E. H. Weitzel, addresses of welcome being given by Governor Spry, Mayor Park and the Rev. P. A. Simpkins. An adjournment was taken just before noon in order to attend the organ recital at the Tabernacle.

The afternoon meeting was called to order at 2 p.m., and after the reading and approval of the minutes of the first regular meeting and of an executive board meeting, which was held at Denver, a letter from A. J. Reef, of Denver, was read. This contained proposed amendments to the constitution and bylaws and upon motion was referred to the executive board with instructions to report at the next regular meeting.

AMENDMENTS TO CONSTITUTION AND BYLAWS

The proposed amendments are as follows:

Article 2 (regarding who may become members and how), to be amended to read as follows:

Membership in this institute shall be of three classes, corporate, individual and honorary. Any company, firm or individual operator, actually engaged in the mining of coal within the territory of this institute, may become a corporate member upon application, and by consent of a majority of the members present at any stated meeting. Any person who is directly engaged, or interested in some branch of coal mining, may become an individual member upon application and by consent of a majority of the members present at any stated meeting. Honorary members may be elected at the discretion of the institute.

Article 10. (Regarding dues.) To be amended to read as follows:

The membership dues of this institute shall be for individual members, two (2) dollars per year, payable in advance; the corporate members ten (10) dollars per year, when operating one mine, or individual operation, and five (5) dollars additional per year for each additional operation conducted by said member, but not in any case to exceed fifty (50) dollars per year, payable in advance.

The funds derived from corporate membership shall constitute a special fund applicable only to conducting investigations into problems of coal mining, and the publication of the results of such investigations, and may not be used for the ordinary expenses of the institute.

A new article to be added to the constitution to read as follows:

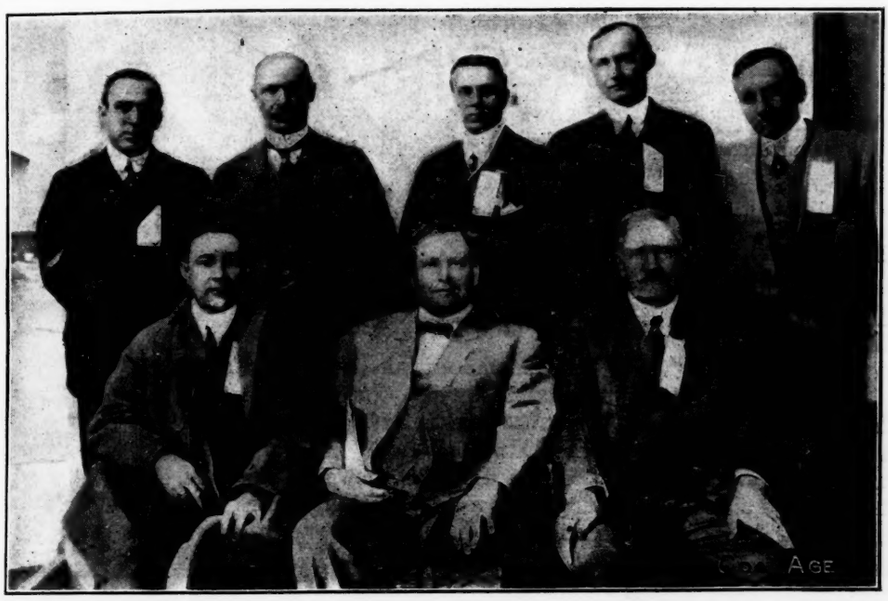
MEMBERS OF ROCKY MOUNTAIN COAL MINING INSTITUTE AT SALT LAKE MEETING, JUNE 11, 1913

Article 13. Any individual member in good standing, present at any stated meeting, shall have the privilege of the floor and be entitled to one vote. Any corporate member in good standing may designate one person as its representative, who, if present at any stated meeting, can have the privilege of the floor and be entitled to one vote.

A new article to be added to the bylaws to read as follows:

Article 2. In order to carry out the purpose of this organization, as expressed in Article 1, of the constitution, "to promote study and research into mining problems," the executive board shall have the power to appoint committees to investigate mining problems, as selected by the board, such investigations to comprise the gathering of information by correspondence, or otherwise, and the conducting of experiments if necessary, and every form of investigation that may seem wise to the executive board. The executive board shall have the power to appropriate and pay out under proper vouchers, the accruing dues of corporate members, with the expenses of such committees, and may, in special cases, pay compensation to committee members."

An invitation to the Institute to become a member of the American Mine Safety Association was read, and upon motion was accepted and the secretary-treasurer instructed to remit the dues. Upon motion it was then ordered that the chair should appoint three members to represent the institute at the next meeting of this association.



SEVERAL INSTITUTE MEMBERS ON AN OUTING AT SALTAIR

From left to right, standing: T. J. O'Brien, sales manager, Gunn-Quealy Co.; P. J. Quealy, gen. mgr., Kemmerer Coal Co.; Floyd W. Parsons, editor, "Coal Age"; W. D. Brennan, asst. gen. mgr., Union Pacific Coal Co.; H. C. Campbell, asst. mgr. mines, Central Coal & Coke Co. Sitting, left to right: Frank Manley, vice-pres. and gen. mgr., Union Pacific Coal Co.; E. H. Weitzel, mgr. of coal mines, Colo. Fuel & Iron Co.; W. J. Murray, vice-pres. and gen. mgr., Victor American Fuel Co.

At 3 o'clock the meeting adjourned, and a trip to Saltair was taken, where the remainder of the day was spent. The morning meeting of June 12 was called to order at 10 a.m., with the president in the chair. After a few selections by the orchestra, the applications of new members were voted upon, the total number of new members being 169.

A Committee on Expenses

A discussion followed regarding the defraying of the expenses of the local chapters, and upon motion it was ordered that the chair appoint a committee to investigate the various methods which might be employed. The committee which was appointed is composed of the following: Frank Young, New Mexico; Louis Hufty, Huerfano Chapter, Colo., and Mark Danford, Trinidad Chapter, Colo.

John McNeil then read his paper on the subject: "The Prevention of Accidents and a Higher Standard of Sanitary Conditions in Our Coal Mines." After a short discussion the meeting adjourned in order that a photograph might be taken of the members of the institute.

The afternoon session was devoted to a trip to the copper properties at Bingham, the members of the institute leaving Salt Lake City at 1:30 and returning at 6:30 p.m.

The morning session of June 13 was called to order by the president. The first subject upon the program was a paper by D. J. Griffiths, of Colorado, the subject being: "What Shall We Do to Avoid Falls from Roofs and Sides?" Afterward, Dr. J. E. Talmage delivered an address upon coal, its geological history and the part it plays in the conservation of energy. At the close of Doctor Talmage's address, the Institute entered into a discussion at considerable length of Mr. Griffiths' paper. As a result, the following resolution was presented and unanimously carried:

Resolved, that it is the sense of this meeting that any systematic method of timbering which contemplates the placing of the supports at regular intervals, is not applicable to the character of the roof overlying the coal measures in the Rocky Mountain regions, and that the only safe method is to require timbers to be set to securely support the roof in each individual working place. It is further resolved that this institute use all fair means to prevent, or repeal, any legislation which would attempt to establish systematic timbering in the several states in which the institute operates.

Doctor Talmage then extended an invitation to all the members to visit the Deseret Museum some time during the afternoon. The president then read a letter on the use of coal dust in concrete stoppings in coal mines, directed to F. N. Cameron, general manager, Black Hawk Coal Co., Salt Lake City, Utah, and signed by H. E. Lewis, superintendent, Black Hawk, Utah. The latter gave the method of placing forms and mixing the materials which make up the concrete mass.

Votes of Thanks

Motions were made and carried, votes of thanks being extended to Governor Spry, Mayor Park, Rev. Simpkins, Doctor Talmage, John McNeil, E. J. Griffiths and F. W. Whiteside, for the part each had taken toward making the meeting a success. Motions were also made and carried, a vote of thanks being extended to the committee of arrangements, Union Pacific Coal Co. and to J. E. Pettit, State Coal Mine Inspector of Utah, for their help in the entertainment.

The afternoon of June 13 was spent in visiting various places of interest about Salt Lake City. In the even-

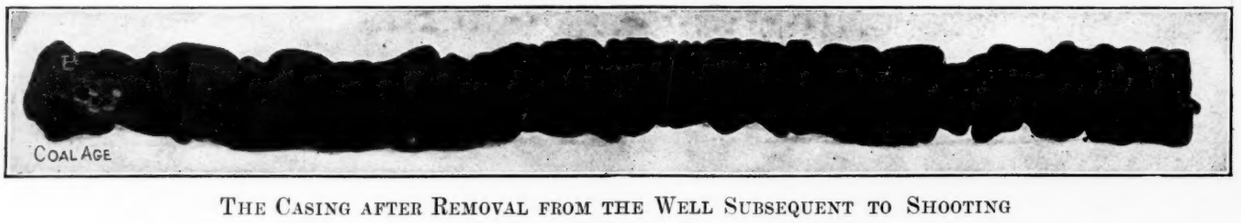
ing the entire institute was entertained with a banquet in the grill room of the Utah Hotel, the ladies of the party being provided a separate feast and entertainment in a separate dining doom. At the close of the banquet the institute adjourned, the visitors leaving Salt Lake City at 1:30 a.m. over the Denver & Rio Grande Railroad.

On the return trip, in a special train over the Denver & Rio Grande, the first stop was made at Castle Gate, Utah, where a modern double-steel tipple with all appliances was inspected, this being one of the few steel structures of this kind in the West. Leaving Castle Gate the party arrived in the evening at Glenwood Springs, where a stop was made in order to enable the members to indulge in bathing in the famous pool at this place. At 8 o'clock the following morning the special train arrived in Pueblo, where members from New Mexico and the southern portion of Colorado changed trains for their several destinations, the special continuing on its way to Denver, where it arrived at noon on June 15. The unanimous verdict of the delegates who attended the convention was, that it was one of unqualified success, the entertainment committee of Salt Lake City and Rock Springs having exhausted every resource in order to provide entertainment for the visitors. The total membership of the institute at the close was 445.

An Example of Good Manufacture

The malleability and ductility of some modern steel products are truly remarkable. The accompanying photograph shows a joint of steel well-casing manufactured by the National Tube Co., after its removal from a well which had been shot.

This pipe was in a well near Gore, Ohio, when a 150-qt. charge of nitrogylcerin, with a 20-qt. anchor-shot was exploded. After the blast this joint of inner casing which had been left in the well was found wedged about 1500 ft. from the surface, the well being 3000 ft. deep.



THE CASING AFTER REMOVAL FROM THE WELL SUBSEQUENT TO SHOOTING

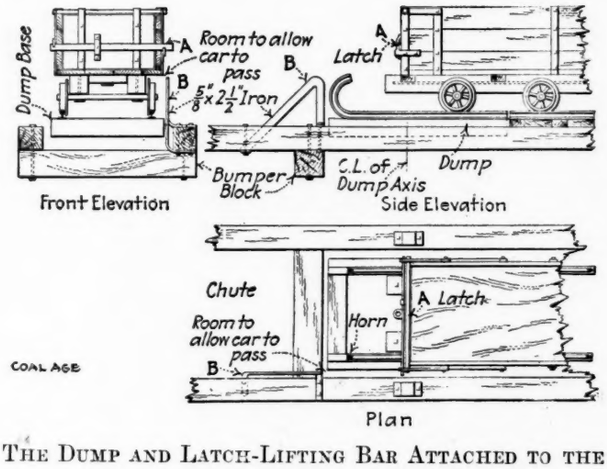
The original length of this joint of casing was between 18 and 20 ft., while its diameter was $5\frac{3}{16}$ in. The force of the explosion crushed or compressed it endwise until its present length is only about 8 ft. As may be clearly seen in the illustration, it shows unmistakable evidence of hard usage, but a careful examination fails to reveal a single serious fracture or flaw.

Device for Raising Mine-Car Gate Latches

BY SIMON H. ASH*

In most coal-mine districts of the state of Washington, the haulage arrangements and tipple equipments are such that all coal is conveyed from the workings to the tipple in mine cars. Of these there are several designs, which are usually discharged by hand from the end, over horned dumps.

The end gate is kept closed by some type of latch that must be raised before the car enters the horns; this latch is usually released by the dumper. In a great many instances, due to excessive speeds, failure to get in sprags, absence of car stops or a tight latch, a car will enter the horns with the latch closed, a continued repetition of which not only causes a considerable waste of time, but will eventually wreck the dump.



THE DUMP AND LATCH-LIFTING BAR ATTACHED TO THE TIMBERING

At the mines of the American Coal Co. the dumps are of the cradle type. The cars have a capacity of 45 cu.ft. The track gage is 3 ft., as is also the wheelbase. The car wheels are loose and 16 in. in diameter.

In the sketch is shown in plan and elevation an arrangement for automatically raising the latch of the mine cars at the dumps, the operation of which is as follows:

As the mine car reaches the dump, shown above, the end gate is closed and remains so until after the car enters the horns, whereupon it tips forward, causing the latch *A* to strike the 2½x⅝-in. strap iron *B* which moves the latch upward, thereby allowing the contents of the mine car to open the end gate.

As the car is tipping forward the latch *A* slides along the top of *B* until the car bumpers strike the bumper block. The iron *B* is long enough and sufficiently close to the car body to prevent the latch from getting caught or jammed by this iron, which would seriously hinder the dumper in returning the car.

By the use of such an arrangement no coal is scattered about before the car is dumped. The latches are always promptly opened, the tippleman has no occasion to be in front of the car while it is in motion, and the device can be adjusted to work on any type of end dump.

*Mining engineer, American Coal Co., Spiketon, Wash.

EDITORIALS

An Unusual Coal Market

In the face of one of the most severe financial stringencies in six years, the coal market is showing an almost unprecedented buoyancy and strength. Summer ordinarily finds the coal business at the low point for the year; consumption is light, coal difficult to sell, and buyers pound prices down to an irreducible minimum. But such is not the case this year. And it is even more difficult to reconcile the situation, because the natural supposition would be that the unsettled conditions in financial circles would tend to further depress the market.

Viewing the situation from a statistical standpoint, it is clear that the market is not being maintained by any restriction in production, as shipments for the year are showing substantial gains over those for last year. Thus the thirteen leading coal roads of the country, which handle about one-third of the entire production, show a fairly substantial increase in shipments for the first four months of the current year, the respective figures being 52 million tons in 1912, and 54 millions in 1913. Of course, this is in a measure due to the suspension in mining which occurred last year, pending the arrangement of a new wage scale. Nevertheless it is a significant fact that even with a larger production, prices are, at the same time, ruling higher. In June of last year the New York prices on soft coal ranged from $2.35 for the low-grade West Virginia steam fuels up to $3.15 for the best Georges Creek; the ruling price for this month, on the same grades, is from $2.25 to $3.25.

The shipments of anthracite naturally show a large increase for the first five months of the current year, as compared with last year, since practically the entire hard-coal production was completely cut off by the suspension in 1912. The output during this period last year was about 20 million tons, as compared with 29 million for the current year. In spite of this condition, it is interesting to note that the stocks at tide are far below those on hand at any time during the last five years, with the exception of 1912, when, of course, all available supplies were in sharp demand because of the strike. At the close of May the stocks at tide were 5,200,626 tons, the previous low record at the end of any month from 1908 to 1911, inclusive, being 6,100,916 tons.

A comparison of the lake movement into the Northwest for the year to June 1 also presents some interesting points. Of course, the greatest discrepancy occurs in anthracite, the shipments for the current year being six million tons, as compared with only 18,000 for the same period last year. Bituminous, however, also shows a most decided increase, the respective figures being 2,890,789 tons for the current year, and 1,653,922 tons last year.

It is thus obvious, as previously stated, that the market is not being artificially sustained by any policy of restriction or other conditions, and the unusual strength must be due entirely to a strong healthy consumption all along the line. The market has reached a point where forced sales, even of the lowest grade, are practically unknown, and buyers have definitely abandoned hope of forcing the producers to recede from their demand for higher prices. The situation is in part due to the restricted labor supply, but this is obviously not very severe, since the production statistics show such substantial increases in the movement of coal.

As a matter of fact, should the production be seriously crippled from this cause, it would create a rather interesting situation, and would probably precipitate a runaway market. Even as it is, the outlook for the producers during the coming fall is highly favorable, and the most conservative companies are agreed that business will establish new high records providing there is no pronounced relapse in industrial activity.

❋

The Labor Supply

The coal industry seldom finds itself free from difficulties of one kind or another. When the demand for coal becomes urgent, and, as a consequence, prices are firm, it usually develops that the railroads are unable to cope with the heavy tonnage, or, as is now the case, the labor supply proves inadequate.

The coal market has seldom experienced such a buoyancy at this time of the year, except when abnormal conditions such as strikes, etc., have prevailed. It is difficult, however, to keep the miners at work during the pleasant summer months, for as is well known, there are few classes of people having such migratory habits as the average coal miner. The weather prevailing during the present spring has been particularly favorable to outside work and thus many of the miners have been attracted to this form of employment, with the result that complaints are general in all the mining districts that there is a pronounced inadequacy in the supply of labor.

It is thus natural that we should turn our eyes upon the inflow of immigrants into this country, as it is only in this direction that we can look for any relief so long as industrial activity continues general throughout the country. The official reports of immigration at present are highly favorable. There have already been several new high monthly records established this year, while the final figures for June promise to exceed the record for that month which was established in 1907. Another significant feature is the fact that the large steamship lines, sailing from continental ports, have found it necessary to put on extra ships during the last two months. Should there be a slowing down in industrial activity, which may be expected as an aftermath of the unsettled conditions in financial circles, it now seems probable that the country will be facing an oversupply rather than a paucity of labor.

In this connection it is interesting to review the new legislation pending, with regard to immigration. It seems now that the literacy test, by which it was proposed to restrict the influx of foreigners down to only the

more desirable classes, has been definitely abandoned. But in its place there is now another bill being offered which proposes to restrict the number of aliens of any nationality to, not to exceed ten per cent. of those already residents in this country, according to the preceding census; it is provided, however, that not less than 5000 of any nationality may be admitted. Aliens returning from a temporary visit do not come under the provision of this act, nor do those coming to join near relatives; members of the professional and business classes will also be admitted without regard to these conditions.

Hydro-Electric Plants

We devote a large space in this issue to hydro-electric plants. View them favorably or not, they are certainly about to become an important factor in the development of the coal industry.

We do not believe that they will be found as disadvantageous to the coal operators as has been feared. The producer sometimes cannot keep pace with the large demand for coal in the winter. The hydro-electric plant serves to lower this "peak load," if we may so express it, as there is no lack of water power during that season. In the summer, a hydro-electric plant which is well supplied with customers may not meet the demand for power as the water is low. Then the standby plants will buy coal and they will enter the market just when the business of coal producing is dull. Thus water-power plants will serve as a flywheel for the industry in all those states where water power competes with coal, as in Maine, New Hampshire, Massachusetts, Pennsylvania and West Virginia among other states.

The disadvantages in the last two commonwealths mentioned and in others where coal is produced and where water power is available is that the water-power plants cut deeply into the market, which is fed only by one or possibly two fields. This local market is not subject to the fierceness of competition experienced in attempting to do business in more distant centers.

It is a well known fact that coal operators often look to the local market for their profits and to the more distant and larger centers of industry for the continued operation of their mines. The local hydro-electric plant tends to cut the ground under the operator's feet, still leaving him, however, the remote markets undisturbed. If it were not for this fact, the water-power central plant would be, it seems to us, a welcome visitor, for nothing is worse for the industry than feverishness in the winter and stagnancy in the summer.

It remains to be seen whether it will pay to construct water-power plants in coal regions. Unless the power developable is almost unlimited, a standby plant must be maintained and consequently the first cost is almost doubled. If the water supply is unlimited, then the cost of damming is excessive and the interest charge becomes equally exorbitant. As coal production can be made more steady, the need for a standby plant is not felt, when a carbo-electric central plant is erected.

Perhaps the coal industry would be better controlled if water-power plants increased in number and would be rendered less stable if numerous carbo-electric plants, using waste fuels, slack, bone and the like, were erected. Such plants would demand the production of higher-class coal that the lower class might be obtained as a by-product. As a result, the mines generating electric power for general manufacturing purposes would glut the market whenever the demand for coal at distant centers became low. They would have to continue operations despite the market demand in order to take care of their local patrons.

In short, the hydro-electric plant would stabilize and the carbo-electric plant might disturb the industry. Certainly coal operators may view water power more favorably than the development of oil and gas fields. The output of fuel wells is not affected by the seasons, and mine operation is made impossible by the strenuous and continuous competition thus developed and moreover the wells add dangers and responsibilities without number to other trials of the coal operator.

The Dead Level

We presume that if the question of socialism were broached in a conversation with almost any operator, he would deliver a short but effective address on the fact that the attempts of individuals to raise themselves above the mass have resulted in the betterment of humanity and that rewards should be permitted to those who earn them.

But that same operator is often a socialist when he builds his town. All his houses are the same, none are ever built any better or even any redder than the others. There are no finer houses for the man who deserves a better house and none for the man who will pay for a more desirable place of residence. The operators say to the working man: All men are equal who live here, there will be no award for merit. You may earn more money if you work more, but I will give you no better way in which to spend it.

The operator can readily see how such a method of reasoning holds back his business. The man who has no incentive to earn a larger wage has no desire to work for any more than a competency which will enable him to live and raise a family on the level of the mass of his fellows. There is no desire to keep a clean house in order to be given one of better construction with pleasanter environment.

Much as we may hate aristocratic sentiments, it has been the rise of these which has advanced civilization. The operator would do well to create such a degree of self-respect in his village as will make the better men endeavor to live more seemly lives. The democracy of the mine village is, in a way, to its credit and in a degree has been its undoing.

The foreman, the doctor and the miner often live in houses which can only be distinguished by most careful inspection, and all the residences in a mining town may be inferior in appearance at least to that which would be inhabited by a mechanic in a small town. The wage is sufficient to permit the miner to live in a good house and we have long wondered that he is almost always required to pay a rental of $6 or $8 a month when he is able to pay more and should demand better quarters.

We urge this in no revolutionary spirit, but advocate only a gradual raising of the mining communities by the building of a few houses of a better type, year by year. By renting these, on demand, to the more desirable tenants, a desire would be created throughout the mining camps for a higher standard of living.

SOCIOLOGICAL DEPARTMENT

Welfare Work Among Miners

By Ira D. Shaw*

SYNOPSIS—The miner argues that if welfare work pays the operator, the latter is trading on the pleasures, as well as on the labors, of his employees; if it does not, it is a charitable scheme and demands money, which should be expended in a wage increase. Welfare work is usually unpopular with the miner, unless he feels that he has originated it. That is why the author thinks it should not be fostered by an industrial corporation.

"Ten years ago the employer of labor thought that, when he had given his employee a fair wage, passable living and working conditions, his full duty as an employer was done. Today every employer of labor feels that he has an obligation toward his employee that mere wages, favorable working conditions, etc., do not discharge. The question is now how to deliver the goods." Such in essence was the remark made a short time ago by the president of one of our largest corporations employing thousands of men in all grades of labor from the most highly skilled down to the least trained. There never was a period in our industrial history when so much welfare work was planned and performed as at present. Many experiments have been made, good, bad and indifferent, but all with the best of motives.

For the purpose of this paper I shall define welfare work as any operation or agency which has for its aim the betterment of any and all conditions so that there may accrue as a result, increased physical, mental and moral efficiency of the individual and eventually of the body politic as well.

Character as the Ultimate Product of Welfare Work

In the coal fields there has been but little done along welfare lines until within the past few years. As a rule the operator has been busy getting out his output at a price that would enable him to meet competition, with little thought of the main factor in production, the human element, for in the last analysis the quantity and quality of the output is going to be determined, not by the kind and number of machines used, but by efficiency and reliability of the human factor, or the real agent of production. This, in its last analysis, comes down to the question of the real character of the employee.

Some of the recent investigations for which our people are getting noted, if not notorious, have brought out that after all the most important factor in all human relationships is character. This fact is just as true in the industrial as in the financial world, and the sooner it is generally recognized and provision made for it the sooner we shall see dimunition of strife in the industrial world.

*Industrial Secretary of the International Committee of the Young Men's Christian Association.

Note—Paper read before the West Virginia Coal Mining Institute, June 25, 1913, at Morgantown, W. Va.

Miner Desires to Spend His Wages Himself

As before stated, many attempts to meet this need for increased efficiency have been made; churches, relief and burial funds, death benefits, educational work, village improvement, gardens, savings banks and many other institutions, good in themselves have been established and their value tried. Some coal companies have invested thousands of dollars in clubhouses for employees, and in some cases confess that the whole scheme is a heart-breaking failure, because the miner has the feeling that every move on the part of the operator to give him something not absolutely needed for daily toil is bound to show up against him on the payroll in some way, though he may not know or understand just how.

This feeling of antagonism between miner and operator is a real condition, and not a theory. I believe it has no adequate foundation, but arises from a misapprehension of motives. However, the feeling exists, and it must be reckoned with in planning welfare work. So far as the writer knows practically all the attempts to better the conditions of the miners have been made either by the initiative of the operator, or at least without any attempt to bring the miner into any vital relationship with its inception, or by some outside agency, such as a church or other social organization or fraternity.

No one who knows the mining industry and the life of the miner denies that he has real needs which at the present time receive very little attention. The commendable agitation for a shorter day and better pay unfortunately does not carry with it a movement which will provide for the occupation of the increased leisure time, and for encouragement to the miner to save a part of his earnings.

The Greatest Danger to Society Is in Misdirected Leisure

No man is likely to become dangerous to society so long as he is working. It is misuse of leisure that in the final analysis works ruin to our laboring men. The man who labors at hard tasks, such as a miner performs, craves something of a stimulating nature when his daily toil is done. The dangerous character of his work adds to this feeling of need for stimulation, as he works under nerve as well as muscle strain, owing to the dangerous nature of his work. The average mining community has no provision for the miner who is in this condition, so one cannot wonder that he takes the most easily procured substitute, alcoholic stimulation, and this gives him temporary relief only, and is sure to bring on detrimental reaction.

In spite of all evidence to the contrary, there are still a few operators who maintain that the miner must have alcoholic stimulation to do his work; yet a study of mine accidents shows that the greater part of them occur just after a holiday, when those who indulge in liquor are coming through the reaction stage, and are not normal physically or mentally. In some communities it is impossible to run the mines on anything like normal

output for several days after the men are paid, owing to the mine employees absenting themselves to drink or to recover from their intoxication.

The Mining Camp Provides Only for Toil and Sleep

Study any of our coal fields: What opportunity is there for any man to use his leisure time for recreation? Many communities have absolutely no semblance of any public institution, even a church, no lodge or other social possibilities. In such a community as this what chance is there for a decent man? The forces of evil are always at work, and are reaching after their victims. Naturally, they are most successful where they have no opposition.

The sooner we recognize that man has a three-fold nature and none of these elements are to be ignored in providing for his welfare, the sooner we shall solve the problem of human efficiency. The mental and moral natures must be considered just as important as the physical, and provision must be made for their development as no mere prizefighter can be a real man, though he may look much like one. So no mere drudge, without developed character can be a desirable citizen. The miner of today is just what his surroundings and those who are responsible for his environment have made him. He is no better and no worse than the miner of tomorrow will be under the same circumstances. It follows that the responsibility must fall largely on those who mold his living conditions. But the miner will react upon his surroundings and make them better or worse according to the motive and the spirit of the operator. All the miner needs is opportunity and friendly leadership, and this latter is all-important.

In some cases much money has been spent to provide clubhouses that have been poorly planned. In others there has been no thought or attempt to provide the proper leadership. In still other cases, men have felt that the company was not only commercializing their labor, but also making a profit off their leisure, even though the clubhouse was a losing venture to the company. Should space permit I could mention a number of cases where real attempts have been made to provide for the leisure time of the miner, but the employees have felt very little interest in it for various reasons.

Human Efficiency as an Outcome of Welfare Work

Successful welfare work can never be carried on without competent leadership. It is just as sensible to install the most recent and efficient mining machine, and then expect it to get results by turning it over to be operated by an ignorant foreigner, who knows nothing of machinery, as to expect a clubhouse to be successful without some competent and skilled leadership. Moreover, welfare work should never be regarded as a charity any more than the installation of uptodate machinery. No operator hesitates to engage the best engineer to lay out his mines and the various features of his operation, but the average operator seems to feel that when it comes to the very important subject of human engineering and raising the efficiency of his most vital factor, the most that is desired or needed is some sort of a place, and too often thinks that that place ought to produce revenue for his own pocket.

The miner has a right to resent any attempt to capitalize his leisure hours, and the exercise of this right has made many attempts unsuccessful. There is now, in the West Virginia fields, a clubhouse built at the expense of not less than ten thousand dollars, where there is absolutely no supervision except that exercised by the mine employees, who have no knowledge whatever of the best method of organizing such work. The operator expects the clubhouse to bring an income of one hundred dollars per month. The work has been done with the best of motives and the operator has the best interests of his men at heart, and honestly desires to serve them; but there is that undercurrent among the men which will doubtless make the success of the venture short-lived so far as the miner is concerned. The patronage will probably be limited to the officemen and the higher grade of employees. This, instead of closing up the breach already existing, makes it still wider, for one of the aims of welfare work should be to make the men of all grades feel that they, after all, have common interests and common needs.

The Need for a Sense of Possession

Successful welfare work must be coöperative so that the miner may feel a sense of proprietorship in the enterprise. Instances may be cited where welfare work under company auspices has been tried and failed, but, on turning the work over to the men themselves under trained leadership the success has been conspicuous. In all cases the emphasis is on strong and wise leadership.

Successful welfare work must avoid all appearance of paternalism and patronizing elements. The miner is an independent being, and resents any attempt to discount his independence. He feels abundantly able to take care of himself, and prefers to do it in his own way, even if it is not as well done as under a paternalistic regime.

In welfare work the initiative should lie with the miners rather than the operator. If the miners feel that they are responsible for the inception of welfare work they feel a much greater personal obligation to support it since the operation has come at their request, and not on the suggestion of the operator.

After studying the whole question of welfare work among miners, the Young Men's Christian Association feels that it has a program to suggest to mining operators that will not fail under any fair conditions. It has been working its way among miners for several years without a failure. It succeeds in enlisting practically every man in the operation in its program, and aims to meet all the social and educational needs of the community, and through coöperation with the church helps to meet the spiritual needs. It is not implied, however, that it holds the only solution to the problem, for doubtless the same method would apply under any competent organization.

The program of the Association calls first of all for an adequate building, which would include the machinery for the three-fold development of the individual. The building or clubhouse should contain shower-baths, a reading room, a bowling alley, pool tables, a hall for moving pictures and other entertainments, which hall could also be used for religious meetings, and classrooms for educational work. The entire plant should be in charge of a man trained in organizing this sort of work.

The Association would not feel justified in asking any company to provide such equipment unless at least 60

per cent. of their English-speaking white men pledge themselves to support the work after it had been established. The entire management of the work is vested in a local committee elected by the men themselves and carried on under the leadership of the general secretary. This feature gives the feeling of proprietorship which is vital to the success of the work. The fact that no work is to be done until the men have pledged themselves to its support makes them feel their responsibility for its success.

The welfare work carried on under such circumstances has brought about a complete revolution in many communities. It provides a clean place for recreation and amusement, as well as an incentive for the increase of personal efficiency. In a single instance the amount of liquor brought into a community by express was reduced from over two hundred gallons per month down to less than fifty gallons in less than three years' time. In the meantime gambling practically ceased. The entire community has put on a new aspect, and the change is noticeable even in the very countenance of the residents.

In another instance, a company had established a splendidly equipped welfare building, and maintained it as a company proposition. After being operated about two years, without success, it was turned over to the Association. The first month of the new regime showed a wonderful change. With a comparatively poorly equipped building the receipts more than doubled, while the saloon keeper in the town declared that his sales for the same month decreased something like four hundred dollars.

This clearly indicates that if the miner is given a clean place, under proper leadership, and allowed to feel that he is to a certain extent a proprietor in the enterprise, he will take care of its success. In all these clubhouses there should be a casino for the sale of soft drinks, candy, cigars and light refreshments, if needed. All these things tend to make the place attractive to the men, and bring about a generous response.

Moreover, in many communities a playground can be attached, to which the secretary can give attention. In all cases there should be provision made for any need of the community that the place can supply. The greater the sense of those requirements, the more easily the facilities may be provided. In all cases the success of the work will depend most largely upon the character and training of the person to whom the leadership is intrusted, and this, after all, is the most important feature of all successful productive operation.

Effect of Belgian Mining Law

Most of the Belgian colliery companies in their annual reports this year, make some reference to the consequences of the law, which, since January, 1912, has limited the miner's day to nine hours. The Charbonnages de Courcelles du Nord, in the Charleroi district, state that their output was about the same as in 1911—450,141 tons, against 449,714 tons—but that it was only thanks to the discovery of a new seam that a reduction was not recorded. The coal, however, was dirtier than formerly, with the result that the cost of washing increased, and new washing installations had to be erected.

At the Gosson-Lagasse Charbonnages, in the Liège district, the new law has involved a rise of 1.53 francs (29½c.) per ton in the cost price, owing to the reduction in the output, combined with loss of effective work by the men, and greater difficulties in recruiting the necessary staff, workers finding it advantageous to seek employment either in the Pas de Calais and Nord districts, where wages are higher, or in other industries not subjected to limitation of the hours of work.

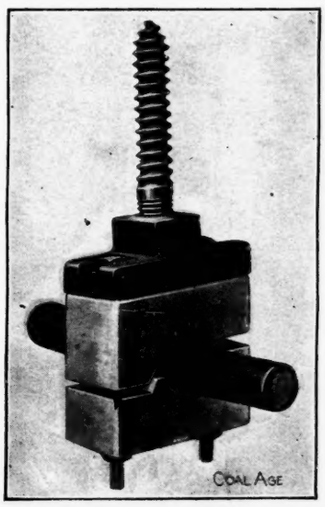
The report of the Charbonnages de la Louvière et Sars Longchamps, in the Centre district, lays stress on the necessity of having larger washing installations, the coal extracted there being dirtier, in consequence of the fact that the miners work with less care than previously in order to gain the same wage in a shorter time. In 1912, the company had to pay to the French Eastern Railways penalties amounting to 27,613 f. ($5329), for 27,257 tons supplied; or 1.013 f. (19½c.) per ton, as compared with 6260 f. ($1208) for 31,412 tons, or only 0.199 f. (about 4c.) per ton in 1911, owing to the dirtier condition of the coal.

The consequences of the new law have, however, been partially offset by a sensible rise in the selling price of coal.

A New Cable Hanger

To facilitate the supporting of feeders in mines, a new cable hanger has recently been placed on the market by the Electric Service Supplies Co., of Philadelphia.

Although this device is particularly designed for suspending feeder cables in mines, yet it is adaptable for use in various other locations. It will accommodate a cable from ½ in. to 1 in. in diameter and permit its insertion or removal after the hanger proper has been permanently installed.



THE NEW HANGER

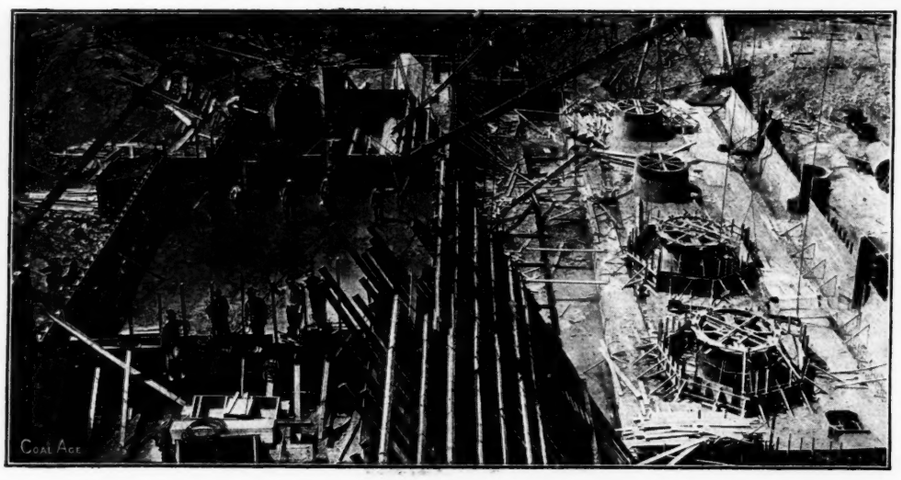
As shown in the illustration, this hanger consists of two porcelain insulators, notched and fitted together to receive the cable and clamp it squarely. These insulators are bolted together, the bolts extending through the cast-iron head which is especially designed to afford easy installation. The clamping surface of the insulators is ribbed to prevent any tendency the cable may have to slip through the clamp and damage the insulation.

These hangers are ordinarily fitted with lag screws 3 in. long, for use in connection with wooden plugs, but for timber work a special lag screw of the same length is furnished. They may also be supported by special expansion bolts. The hangers are 3¼ in. wide by 4½ in. high, exclusive of the lag screws or expansion bolts. All metal parts are heavily galvanized to effectually withstand the action of rust, and all parts are designed to meet severe service and afford an easy means of supporting heavy cables.

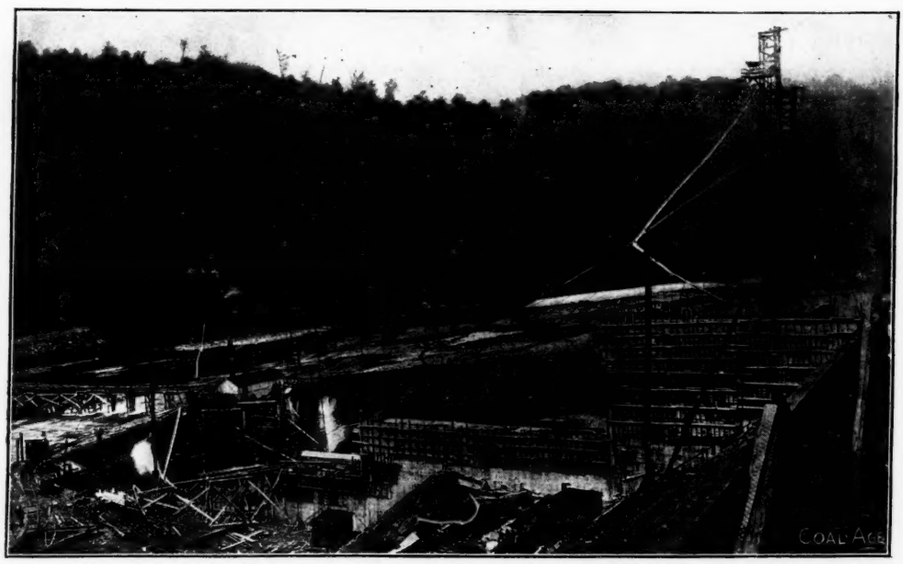
The Cheat Haven Water-Power Development

A Plant Owned by the Hydro-Electric Co. Which Will Furnish Power to Compete with Coal. Visited by West Virginia Coal Mining Institute, June 24

View of the west bank of the river, taken from the opposite side. Shows the T. A. Gillespie Co.'s concrete plant and the Cheat Haven & Bruceton R.R. Cheat River in foreground and at its edge cofferdam enclosing power house and a part of the dam.



View looking down on power house. Shows also bulkhead between power house and bank. One of the forms in the rear is being filled with concrete from a chute. On the right are the upper ends of the draft tubes.



View looking down the Cheat River from the east bank, showing another view of the power house and the towers from which concrete is spouted to the many forms on the left. A construction trestle can be seen crossing the river.

DISCUSSION BY READERS

Mixed Lights in Mining

Letter No. 3—In my opinion, it is not safe, under any conditions incident to coal mining, to use mixed lights in a mine known to generate explosive gas regularly or at intervals. I will offer three reasons in support of this opinion:

First, the workmen in the open-light section of the mine are liable to enter the gaseous section with their open lights and cause an explosion.

Second, the workers in the non-gaseous section where open lights are used are liable to encounter or meet an outburst of gas, at any moment, as the working faces advance.

Third, when one section of a mine is compelled to use locked safety lamps, it often creates dissatisfaction among the workmen.

It is a well known fact that few miners care to use locked safety lamps, especially when open lights are in use in portions of the same mine. The foreman often finds it difficult to get men to work in the safety-lamp section under these conditions. He will sometimes take chances and place some of the gassy workings on open lights, in order to get men to work in that section, and to advance the face equally with the open-light section.

I believe that if all mines that are gaseous or liable to encounter gas were worked exclusively with approved locked safety lamps and the miner thoroughly instructed in the use of the same and only permitted explosives were used for blasting and all places examined before a shot is fired, there would be less danger of accident from explosions of gas.

MINE FOREMAN.

Expedite, Penn.

❖

The Air Current and Mine Explosions

Anyone reading the interesting article contributed by Mr. Verner on the Cincinnati mine explosion cannot but be impressed with the fact that the installation of large modern fans for the ventilation of mines has not reduced the fatalities produced by explosions as we would naturally expect. The opposite of this seems to be the case; that is to say, we are having disastrous explosions in mines where we would least expect them, considering the efficiency of the ventilating machinery installed.

A notable example of this was the Marianna (Penn.) explosion, Nov. 28, 1908. The Marianna was a mine that was equipped with the express purpose of being uptodate in every way and free from danger. Some of the leading mining experts of Europe had examined it about two weeks before the disaster occurred, and gave it as their opinion that the mine was all that had been claimed—a really model mine. The state inspector had just finished his examination of the mine when it exploded.

These facts have given rise to questions similar to the questions raised by Mr. Verner; but seemingly mining men, thus far, have been unable to find out the reason why such uptodate equipment fails to provide the desired immunity from fatal and terrible disasters.

The gases pent up in the coal seam and surrounding strata, under pressure, are given off more freely in proportion as the pressure is reduced. Large exhaust fans have, therefore, evidently much to do with the rate with which gas exudes from the coal and other strata. The reduction of pressure when a powerful exhaust fan is in operation also allows the gas to expand in the gobs where it accumulates in considerable volume because the air current does not reach those places. This difficulty could be overcome, to some extent, by making the fans compressive instead of exhaustive. The compressive system of ventilation produces a greater pressure against the escaping gas than the atmospheric pressure. Then, if the barometer is falling, the pressure in the mine can be increased by increasing the speed of the fan and thereby offset the dangers that arise from atmospheric changes.

On such occasions some superintendents might desire to increase the pressure (water-gage) without increasing the quantity of air passing into the mine per minute. This could be accomplished by means of a regulator placed in the main return airway (blowing system), and which could be arranged to give the same quantity of air with almost any reasonable water gage. Regulators are not generally regarded as an uptodate appliance and should not be used where they can be avoided; but, for the purpose stated, I believe they could be used to advantage.

In the west of Scotland, many of the mines give off large quantities of blackdamp and the officials have some difficulty in keeping the mines in a healthy condition, even when the atmosphere is in a normal condition; and at times of sudden atmospheric changes they have had to shut down, owing to the gas almost filling the mine. At one of the mines, the loss of time from this cause was so great that the officials decided to try a compressive fan, with the result that there was no further trouble from blackdamp. The compressive fan, in this case, was able to regulate the flow of gas regardless of atmospheric changes. Had this mine generated marsh gas and the gobs been full of explosive gas, the flow of gas from the strata and the expansion of gas in the gobs would have been as readily controlled as was the blackdamp.

In the large modern mines of today, the old workings and other places where gas can accumulate are more extensive than in mines formerly. Large abandoned places may be sources of danger from causes that are not suspected. When these places are known to contain explosive gas they are generally walled off and made safe, as a brick wall will keep anyone from entering the place with an open light and causing an explosion. But it should not be expected to absolutely prevent the gas from escaping into the roadway.

It is well known that gas exudes more readily and in greater quantity at a fault or where the strata are broken

or disturbed, and this was probably the cause of a greater quantity of gas than usual accumulating at the face of the heading, in the Cincinnati mine, where it was a little later ignited. Another point that should not be overlooked is that, although the mine was free from marsh gas to the extent that open lights were used, the fact that explosive gas was known to be generated in the workings, proves that there must have been a certain small percentage of gas in the air, which with coal dust would make a highly explosive mixture, in mines circulating large quantities of pure air.

ROBERT MCCUNE.

———, Scotland.

Waste of Mine Timber

The article on this subject, published in COAL AGE, Apr. 26, p. 653, was particularly interesting to me, as my experience firebossing for a number of years has taught me that it is not what is *made* in coal mining as much as what is *saved* in mining operations, that makes the work successful.

The careful miner will consider that every prop, cap piece or tie lost or wasted increases to that extent the cost of the production of coal and makes it more difficult for the operator to pay good wages or to undertake needed improvements in the mine. In other words, waste on the part of the miner only makes the conditions under which he must work more disagreeable and dangerous.

I know from experience that there are thousands of good props and ten times that number of cap pieces lost and destroyed by the neglect and carelessness of the miner, who will order timber brought to his place when he has posts back in the gob that he could use if he would take the trouble to get them. In many cases, much of the blame rests on the men who select the timber and who send in sticks 4 ft. in length, instead of 4 ft. 6 in. as ordered. To avoid the annoyance of such a mistake, some miners will order a 5-ft. prop where a shorter length would do, intending to cut the stick to the proper length, which always means waste.

More care should be exercised by the room boss to see that every miner orders such timber as he can use without undue waste; and that the timber is delivered promptly to the right place by the driver; and that miners do not order more timber than they need and use what they order; and that no timber is left in the gob that can be used again.

In the mine, where I have been employed, it was the custom, as soon as a room was worked out, to send a day man into the place to get out every stick, cap piece, tie and rail that could be removed and used.

JOHN SUTTON, Fireboss.

West Terre Haute, Ind.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

PROPERTIES AND BEHAVIOR OF GASES

The symbols, molecular weights, densities and specific gravities of the common mine gases have been given in another place. The properties and behavior of these gases in the mine will be treated here from a practical, rather than a theoretical standpoint.

METHANE

This gas is commonly known as "marsh gas" or "light carbureted hydrogen," it being the lightest of the hydrocarbon gases. It is a colorless, odorless and tasteless gas. It is combustible, burning with a pale-blue flame, in the air or in oxygen. It contains no oxygen and is not, therefore, a supporter of combustion, in the generally accepted meaning of the term. A lamp flame is quickly extinguished by this gas unmixed with air. Mixed with air in certain proportions, the gas becomes explosive, the mixture being known as "firedamp." Marsh gas is not poisonous, but when unmixed with air suffocates by excluding oxygen from the lungs. The diluted gas can be breathed for a long time with no ill effects, except a slight dizziness, which quickly passes away on return to fresh air.

Marsh gas is the most common of the occluded gases of the coal formations. It seldom, if ever, occurs pure, but is mixed in varying proportions with other hydrocarbons (olefiant gas and ethane) and often with nitrogen. These mixed gases greatly modify the character and properties of the pure gas.

Marsh gas issues from the strata into the mine workings where it accumulates in quantity, unless removed by a copious air current. The most gaseous seams are those that are overlaid with a compact rock, slate, or shale that is impervious to gas and not traversed by faults, which would allow the gas to escape. Gas is generated most freely from a virgin seam and from a freshly exposed face of coal. Hence, new workings generate more gas than old workings; because, in the old workings, the gas has mostly drained from the strata and escaped.

Marsh gas diffuses rapidly into the air and other gases, the rate of diffusion depending on the relative densities of the two mediums. The question is often asked, if the diffusion of gas is so rapid how is it possible for a large body of gas to accumulate in a void place in the mine. The reason is that diffusion only takes place at the surface of contact, and is therefore limited, and the gas is being generated faster than it passes away.

Marsh gas being lighter than air tends to accumulate at the roof and at the head of steep pitches and in rise workings. It is found in such places where the air current is not sufficiently strong to sweep away the gas and in other poorly ventilated or abandoned places. Gas can generally be found at the roof or close to the face of the coal in chambers generating gas. It is detected by observing the flame of a safety lamp. If gas is present in sufficient quantity in the air a faint nonluminous cap will appear surmounting the flame of the lamp. The gas also lengthens the flame.

The Coal Age Pocket Book

FIREDAMP

All gases were formerly known to the miner as "damps," which is a word of Dutch or German origin meaning vapor or fumes. Later, as the characters of the different gases became known, they were named according to their several characteristics. The term "firedamp" was applied to any inflammable or explosive mixture of gas and air.

The word firedamp, today, in this country, means any inflammable or explosive mixture of marsh gas and air, with or without other gases. In England, the word is taken to mean any mixture of marsh gas and air without regard to whether or not the mixture was inflammable or explosive, which, however, is not its logical meaning.

When but a small amount of marsh gas is mixed with pure air the gas is so diluted that the mixture is not inflammable. In contact with flame, this small percentage of gas in the air adds to the combustion of the flame and lengthens the flame; but the flame is not propagated throughout the mixture, as the absorption of the heat by the air is too great to maintain the temperature necessary for combustion.

Lower Inflammable Limit—As more gas is added to the air, a point is soon reached where the combustion of the gas develops sufficient heat to raise the temperature of the air to that required to maintain the combustion. When this point is reached the flame causing the ignition is extended or propagated throughout the mixture. In other words, the mixture becomes inflammable, because the combustion is supported in the mixture independent of any other source. The theoretical percentage of gas in the firedamp at this point, as calculated, is slightly above 2 per cent., for dry air or saturated air. The heat absorbed by the water of saturation is so slight in comparison that it can be ignored without appreciable error. There are heat losses, however, that cannot be calculated, which fact raises the lower inflammable limit of pure marsh gas to about 5 per cent.

Effect of Dust and Other Gases—Owing to the fact that marsh gas is rarely, if ever, found pure, but is generally mixed with dust or other gases or both, it is never safe to work with open lights, in air containing more than 1 per cent. of gas, in bituminous mines; or 2½ per cent., in anthracite mines.

Gases are divided into two general classes, in respect to the effect they produce on the inflammability of firedamp. Gases having a lower ignition point than marsh gas, as for example, carbon monoxide, hydrogen sulphide, ethane and olefiant gas, lower the inflammable limit of firedamp, as given above. Fine coal dust floating in the mine air has a similar effect, in proportion as the dust is highly inflammable. On the other hand, extinctive gases such as nitrogen and carbon dioxide raise the limit given above.

In the working of bituminous mines, coal dust is a most dangerous factor, especially when the coal is highly inflammable. In many cases, the finely divided dust produces an explosive atmosphere even when no gas is present. The presence of such dust in the mine air, acted on by the flame of a blownout shot, is certain to cause trouble.

INQUIRIES OF GENERAL INTEREST

Effect of Carbon Dioxide on Flame of Carbide Lamp

What is the effect of carbon dioxide in the mine atmosphere, on the burning of the acetylene lamp?

CARBIDE.

Shenandoah, Penn.

Carbon dioxide (CO_2), being an incombustible gas, acts when present in the atmosphere not only to dilute the air and thus reduce the percentage of oxygen present; but, with the nitrogen of the air, absorbs a considerable proportion of the heat developed by the combustion. The acetylene gas is the combustible and the oxygen of the air the supporter of combustion. The reaction that takes place is as follows:

$$2\,C_2H_2 + 5\,O_2 = 4\,CO_2 + 2\,H_2O$$

The reaction shows that the acetylene flame, like other flames, is dependent on the oxygen of the atmosphere for its combustion; but not necessarily to the same degree as other flames. The acetylene flame, like the hydrogen flame, is more tenacious than either the candle or oil flame. In other words, the acetylene flame will continue to burn in an atmosphere where other flames are extinguished. This fact has been observed in the mine, in places generating blackdamp. Blackdamp is composed largely of a mixture of carbon dioxide, nitrogen and oxygen. The percentage of oxygen in blackdamp is, therefore, much below the normal percentage of oxygen in the atmosphere. Blackdamp, as found in the mine, is an *artificial atmosphere* and generally contains sufficient oxygen to support the burning of the acetylene flame. In such an atmosphere it requires 50 per cent., more or less, of carbon dioxide to extinguish the flame of the acetylene lamp.

When the acetylene lamp, however, is placed under a bell jar and allowed to burn until it is extinguished, the percentage of carbon dioxide in the air within the jar has been found to be 6.3 per cent. This is called a *residual atmosphere,* much of the oxygen of the air having been consumed by the combustion of the flame. In this connection, the article, "The Carbide Lamp and Carbon Dioxide," COAL AGE, Vol. 2, p. 128, will be of interest to those studying the subject.

Experiments were recently made at the U. S. Federal Testing Station, Pittsburgh, to compare the burning of the Taylor acetylene lamp with that of a candle. In these experiments, the candle was first placed under a bell jar and allowed to burn until it was extinguished, the time required being 1 min. 59 sec. The Taylor lamp placed alone under the same bell jar burned 2 min. 2 sec., when it was extinguished. The candle and lamp were then placed together under the same bell jar, the lamp having a small flame. In this case, the candle was extinguished in 47 sec., while the lamp burned 3 min. 9 sec. The same experiment was then performed, the lamp having a large flame. The candle burned 29 sec., and the lamp was extinguished in 1 min. 18 sec.

Fan Ventilation

Kindly explain in COAL AGE for what purpose the Pitot tube is used in fan ventilation.

READER.

Belleville, Ill.

The Pitot tube has been used, in recent years, for determining the velocity of the air current more accurately than can be determined by the use of the anemometer, in making fan tests. The Pitot tube is a simple tube of small bore about ½ in. in diameter, attached to the water-gage tube and used in connection with it, to determine the velocity head of the air current from which the velocity of the current may be calculated.

As is well known, the water-gage tube should be so arranged that the air current will pass its mouth at right angles to the length of the tube; and often a thin plate is fixed to this tube flush with its mouth so as to direct the current of air in a direct line across the mouth of the tube and prevent any tendency of the air either to enter the tube or draw away from the tube. By this arrangement the tube measures only the static pressure of the air current.

The end of the Pitot tube, however, is bent in the direction of the advancing current, so that the full force of the current is directed into the mouth of the tube. When so arranged, this tube measures the entire pressure producing the flow of the air, which corresponds to the sum of the pressure head and the velocity head.

Now, if the first tube is connected with one arm of the water gage, and the second tube with the other arm of the same gage, it is evident that the reading of the water gage will measure the difference of these two pressures, which is the pressure due to the velocity head, expressed in inches of water gage.

The velocity is then calculated from the reading of the water gage, the calculation being based upon the fundamental equation $v = \sqrt{2gh}$. It must be remembered, however, that in this equation, v is the velocity in feet per second and h the head of air column in feet, g being the value of the force of gravity (32.16), i the gage, and water being 815 times as heavy as air.

$$v_{ft.\text{-}sec.} = \sqrt{2\,g\,h_{ft.\ air}}$$

$$v_{ft.\text{-}min.} = 60\sqrt{\frac{2 \times 32.16 \times 815\,i}{12}} = 3965\sqrt{i}$$

Or, for any other gage than water, specific gravity $= G$.

$$v_{ft.\text{-}min.} = 3965\sqrt{Gi}$$

The velocity head is a comparatively small reading in a water gage, and, to increase the accuracy of the results, it is advisable to use either alcohol or petroleum instead of water, in the gage. In either case, the specific gravity G of the alcohol or the petroleum should be carefully determined. As an illustration, taking the specific gravity of petroleum as 0.878, a gage reading of $\frac{1}{16}$ in. would indicate a velocity of 928 ft. per min.

EXAMINATION QUESTIONS

Miscellaneous Questions

Answered by Request

Ques.—A shaft 500 ft. deep is full of water; what is the pressure per square inch and per square foot, at the bottom of the shaft, due to the weight of the water?

Ans.—The pressure due to the weight of the water is found as follows:

$$500 \times 62.5 = 31{,}250 \text{ } lb. \text{ } per \text{ } sq.ft.$$
$$500 \times 0.434 = 217 \text{ } lb. \text{ } per \text{ } sq.in.$$

Ques.—(a) How many 3-in. pipes will present a sectional area equal to that of one 12-in. pipe. (b) If all the pipes are of equal length, will this number of 3-in. pipes discharge more or less water, in a given time, than one 12-in. pipe, and why?

Ans.—(a) The sectional areas of these pipes are:

One 12-in. pipe, $0.7854 \times 12^2 = 113.1$ sq.in., nearly.

One 3-in. pipe, $0.7854 \times 3^2 = 7.07$ sq.in., nearly.

The number of 3-in. pipes, therefore, required to give the same sectional area as a single 12-in. pipe is $113.1 \div 7.07 = 16$ pipes.

(b) Approximately, the discharge of a pipe line, for a constant head, varies as the square root of the fifth power of the diameter of the pipe. In other words, the discharge ratio is equal to the square root of the fifth power of the diameter ratio. Indicating the discharge of one 12-in. pipe by G_{12}, and the dischargee for sixteen 3-in. pipes by 16 G_3, the ratio of discharge, in this case, is

$$\frac{G_{12}}{16\,G_3} = \frac{1}{16}\sqrt{\left(\frac{12}{3}\right)^5} = \frac{1}{16}\sqrt{4^5} = \frac{\sqrt{1024}}{16} = \frac{32}{16} = 2$$

This shows that one 12-in. pipe will discharge twice the quantity of water that sixteen 3-in. pipes will discharge, under the same head and for the same condition of the pipes, the length of all the pipes being equal. The reason is that sixteen 3-in. pipes present a very much larger rubbing surface, which increases the friction and decreases the quantity of the flow.

Ques.—What are the essential features to be observed in building and maintaining mine roads, in order to secure the safe, speedy and economical handling of the coal?

Ans.—When laying out a permanent mine-haulage road, it is advisable to straighten the entry as far as practicable by taking off a "skip" on the rib, where the entry has not been driven on line. It is also well to bring the roadway, as far as practicable, to a uniform grade that will favor the movement of the loaded cars. The most economical grade for this purpose is 1½ per cent. When this has been done, the road should be well timbered and drained and the roadway ballasted, especially where motor or rope haulage is employed. The track ties should be spaced an equal distance and not too far apart, so as to provide a good bedding for the rails. Iron rails should be used on all main-haulage roads, and the weight of the iron should be adapted to the weight of the loaded cars and motors. There is no economy in using too light rails. The haulage roads should be of sufficient width to afford a clear passage of not less than 2 ft. on at least one side of the track; but where this is impracticable, refuge holes should be cut in the rib, at short intervals. All roadways should be regularly cleaned at frequent intervals of time.

Ques.—Explain the method of calculating the percentage of gas in an air current.

Ans.—The percentage of gas in mine air is determined by observing the height of the flame cap, in an approved safety lamp exposed to the gas. It has been the custom among firebosses to guess at the height of the flame cap. The best results, in testing, are obtained by the use of a lamp having a free upward circulation of air. The air should enter the lamp at a point below the flame and, ascending, pass out through the gauze chimney. The lamp most commonly used in testing is the unbonneted Davy lamp. When such a lamp is used, burning sperm or cottonseed oil, the percentage of gas (J) may be calculated from the height (h) of the flame cap, in inches, by means of the formula

$$J = \sqrt[3]{36\,h}$$

For example, if the height of the flame cap is ¾ in., $h = 0.75$; and the percentage of the gas, in this case, is

$$J = \sqrt[3]{36 \times 0.75} = \sqrt[3]{27} = 3 \text{ per cent.}$$

It is often difficult to obtain a good average test for gas, in a strong air current. In such a case, it is necessary to shield the lamp from the direct force of the current and obtain a number of readings, in different parts of the airway, in order to secure a good average reading.

Ques.—Assume that a pair of headings, each 5 ft. high and 8 ft. wide, is being driven to the rise, on a grade of 10 per cent., and one of these headings is standing waiting for the crosscut, which is almost through, when the fireboss reports that the idle heading is filled with gas to within a foot of the bottom, at the face. Calculate the quantity of gas in the heading.

Ans.—The thickness of the seam being 5 ft., if the gas is observed 1 ft. from the bottom, at the face, there is $5 - 1 = 4$ ft. of gas, at that point. Then, the rise of the heading being 1 in 10, the distance the gas reaches back from the face is $4 \times 10 = 40$ ft. The section of the heading filled with gas is in the form of a wedge measuring 4 ft. on end and 40 ft. on the base and 8 ft. wide. The volume of this space is $\frac{8 \times 4 \times 40}{2} = 640$ cu.ft.

This method of measuring gas is that commonly employed by firebosses, but is only suggestive of the relative amount of gas present. As a matter of fact, there is no definite gas line above which all is gas and below which all is air. The point at which the fireboss reports gas is the point where he first observed the cap in his Davy lamp, and represents, approximately, 2.5 per cent. of gas. Above this poinut, the percentage of gas increases and below it decreases.

COAL AND COKE NEWS

Harrisburg, Penn.

A bill has been introduced amending the act which provides that wash houses be established at all collieries, when application is made by 20 or more men, and compels the company to erect a suitable place for men to wash and change their clothes after coming out of the mines; the amendment reads that the petition of the men must be complied with 8 weeks after making application. This bill passed the House and is now in hands of the Senate Committee on Mines and Mining.

The McKay bill making it unlawful to discharge into any running stream, any coal, culm, mine refuse or ashes, has been sent to the Governor the second time, for it was recalled a few days ago to be amended, the amendment striking out the word "ashes."

The bill does not apply to water pumped or flowing from any coal mine where the coal, clum and refuse have been removed therefrom, nor does it prevent the discharge of sewage from any public sewer system owned or maintained by any municipality.

The bill carries a fine of $100 for each offense and $50 for each day that the offense is maintained, or imprisonment not exceeding one month, or both at the discretion of the Court.

The purpose of this bill is to eliminate the polluting of streams in the anthracite coal region with culm, etc., which in times of high water washes onto the farmlands lying along the several rivers and creeks, resulting in suits for damages.

On July 1, a hearing will be held by the United States District Court in Philadelphia of the suit brought by J. B. Coryell, trustee in bankruptcy for Dimmick & Co., against a number of officials of coke manufacturing companies of Uniontown, Penn., alleging a conspiracy in restraint of trade.

The men against whom suit is brought, are Isaac W. Seamans., J. P. Brennan, C. E. Lenhart, A. P. Austin, R. W. Fry, Julian Kennedy, J. H. Hoover, G. D. Harrarh, J. W. Abraham, E. H. Abraham, R. W. Gilmore, G. B. Gilmore, L. W. Fogg, W. G. Rock, John Harding. G. D. Howell, J. V. Thompson and Wiley L. Byers. The alleged conspiracy it is charged is a violation of the Sherman anti-trust laws.

Dimmick and Co., before their bankruptcy last March were dealers in coke, having offices in Uniontown, Philadelphia and Cleveland, Ohio and doing a business, it is declared, of about $4,000,000 to $5,000,000 a year. They received most of their coke from ovens at Uniontown, owned and operated by the defendents in the above suit, and had contracts, it is alleged, for long terms with the companies of which these defendents are officials.

The charge is made that a combination was formed not to sell any more coke to Dimmick and Co., and it is alleged that they organized a selling company, called the Consumers Co., and, further, that they raised the price of coke from $1.70 to $4 a ton. Owing to the great increase in price, Dimmick and Co., refused to buy. The Consumers Co. took the coke thus refused by Dimmick & Co. and sold it.

Dimmick & Co., charge that they had contracts to meet, and in order to fulfil them had to buy coke at the greatly increased price. The result, they say, was a loss of $400,000 so that they were forced into bankruptcy. They now seek reparation for their loss, and claim that the sole object of organizing the Consumers Co. was to drive them out of business.

This is commencement month in the anthracite coal fields as well as at the great universities and colleges of the land. The boys who receive their diplomas from the various technical schools have in the majority of cases only a vague idea of just what use they will make of their education. On the other hand, the young men ranging in age between 20 and 30 who have passed the examination of the technical schools maintained by the various anthracite companies and the Y. M. C. A., with the coöperation and financial assistance of many of the operators, have an extremely definite idea of what use they will make of their added knowledge.

These are the men who will earn more money because they are better fitted for the many positions in and about the mines for which special training is not only advisable but often necessary. These are the men who will save human lives, since it is the men familiar with such subjects as mine gases, mine ventilation, mine law, mine surveying, electricity and magnetism, mechanics, compressed air and kindred subjects who are best fitted to keep the mine safe and warn the uninstructed and ignorant of the dangers in their way.

These are the men who can save money for the public which must ultimately pay for the increased cost of mining due in some degree to the blunders of an ignorant past. These are they who can raise the standard of living in the anthracite coal fields and the operators are welcoming their awakening to the opportunities of the schools as it makes for better citizenship, more efficient labor and greater contentment.

This does not in any way detract from the value and dignity of our great universities. The students in these technical schools make more definite and immediate use of their opportunities than the average college graduate. The education acquired in the anthracite coal fields is secured in evenings of study after days of labor in the mine, and therefore is valued at its true worth.

In coal mining, as in many other walks of life, a man's efficiency depends largely upon his knowledge of the subject in hand and his ability to use that knowledge to the best possible advantage.

PENNSYLVANIA

Anthracite

Bloomsburg—Judge Evans of the Columbia County Court has granted a preliminary injunction against the Midvalley Coal Co., restraining it from mining coal on Columbia County land, which the Lehigh Valley Coal Co. claims. Back of this action is a controversy for title to a vein of coal which was discovered by Lehigh Valley engineers and is conservatively estimated to be worth $1,500,000. There has been some confusion about the leases to this property and the Lehigh Valley Co. claims that the Midvalley people have disregarded warnings not to mine the coal and have already sunk a tunnel into the property.

Hazleton—The State Railroad Commission has dismissed the complaint filed against the Lehigh Traction Co. demanding that cars be run exclusively for miners between Hazleton and Freeland. In so doing the Commission held that the traffic does not justify special cars since the miners quit work at different hours. The complaint admits that the company has separate compartments in its cars for miners returning from work, but the Commission holds that there is no way to prevent an occasional overflow which brings the miners in contact with other passengers.

Harrisburg—Although Senator Wm. E. Crow, of Fayette County, is quoted as saying that no settlement upon the controversy arising over the Workmen's Compensation Bill is in sight, it has been reported on good authority that a plan which may prove acceptable is being evolved and a final effort will be made to bring about the enactment of the measure.

A bill has been passed relating to the dockage of anthracite coal at the mines on which to compute the earnings of the miners.

Philadelphia—The strike of the Reading car repair men has as yet had no preceptible effect upon the coal tonnage handled by that railroad. The Reading authorities say that as things now stand they can get along with the force as reduced by the strike for a considerable time.

Pottsville—Rumor has it that the Mill Creek Coal Co. contemplates opening the coal measure in the Wolf Creek Valley north of St. Clair. The openings will be made west of or below the new reservoir recently constructed by the Pottsville Water Co., and hence will in no manner injure the quality or lessen the quantity of the supply.

Bituminous

Greensburg—The first-aid contest of the Keystone Coal & Coke Co. for the cup presented by L. B. Huff was won by the Arona team with a score of 99¾. Three teams tied for second place and the prize of $40, the money being divided among Keystone Shaft, Carbon and Saley. The Greensburg team took third place and a prize of $20.

Cairnbrook—At the new operation of the Lackawanna Coal Co. coal is being removed but is stored in cars on the ground, as the Pennsylvania R.R. has not yet completed its extension up Shade Creek. It will possibly be the middle of July before any shipments can be made. It is probable also that the Berwind-White Coal Mining Co. will soon start to operate in this territory and a large tonnage will, therefore, be taken out.

Pittsburgh—Word has just been received in coal and railroad circles here that the Coleman tract of land in the Allegheny Valley just west of Rimersburg, comprising about 9000 acres, has been purchased by a syndicate of Philadelphia capitalists. With the development of this property a new railroad will be built to haul the output, thus bringing heavy coal supplies into the market. About 800 men will be employed in the preliminary work.

Universal—A fire occurred on June 22 which caused damage to the amount of approximately $25,000 and was extinguished only after a bucket brigade of 500 men had fought it for four hours. The fire broke out in the kitchen in the home of Emil Elovich, a Lithuanian, at about two o'clock a.m. The entire family, father, mother and five children, made their escape down a ladder from the second story. The flames spread rapidly from house to house before the town could be awakened.

Bellefonte—During a heavy thunder storm on June 25, the lightning struck one of the rails of the track of a coal mine near Clarence. The current traveled down the rail into the mine, killing one man and injuring three others.

Connellsville—Two unknown men were run down and killed by a coke train on the track of the Davidson ovens near here June 26. Shortly before the accident the men wandered onto the property and told the workmen that they merely wanted to see the coke ovens. It was raining and they climbed on the ovens to dry their clothing. Not being familiar with the making of coke the men did not know that the small coke engine and cars pass over the tops of the ovens.

Active operations in the Greene County portion of the lower Connellsville coke region have been begun. The Portland Coke Co. has 50 of its 100 ovens completed and has begun shipping some coke. The Reliance Coal & Coke Co., which is building 400 ovens just below Brownsville, will begin shipments in a couple of weeks.

WEST VIRGINIA

Charleston, W. Va.—An official call for a strike of miners in the New River coal field was issued June 25, from the local Headquarters of the United Mine Workers of America. This order is to be effective July 1. Several thousand copies of the call for the strike have been ordered printed and will be distributed throughout the district within the next few days. Coal operators in the New River field have asked that these copies be recalled in the hope of reaching some terms which will avoid a strike.

The miners of the Paint and Cabin Creek coal fields plan to enter suits for heavy damages against those responsible for the killing and wounding of miners and members of their families during the recent labor troubles. One of the suits of principal interest will be that of Mrs. Maud Estep, the widow of Susco Estep, the young miner who was killed by a bullet while getting his wife and children to a place of safety. This shooting occurred at Holley Grove on Feb. 7.

Bluefield—It has been learned that a new coal company has been organized and will be in operation within a short time. This company will be known as the Trace Fork Coal Co., and will be located at Mullen. Side-tracks are now being laid. The Pocahontas No. 3 seam will be worked and everything is being rushed for the opening of the new mine.

KENTUCKY

Jenkins—The Consolidation Coal Co., now building a veritable city at Jenkins, has begun work on a $30,000 hospital at that place, which will be the largest institution of the kind in the northeastern section of the entire state. The new hospital will take the place of the temporary building erected there two years ago.

TENNESSEE

Nashville—The Nashville Traffic Bureau is looking for a decision by the Interstate Commerce Commission in the Nashville coal rate case. A decision has been expected in this case for some time and is awaited with much interest. A material reduction is sought in the rates on coal, it being maintained that there is discrimination against Nashville in this commodity.

South Pittsburg—The Rexton coal mines, owned by the Tennessee River Coal Co., are making preparations in order to begin working by the time the coal season begins in the fall.

OHIO

Cincinnati—There are numerous indications of a volume of business this summer and autumn which will exceed in value and tonnage all records that have yet been made. Orders for coal are said to be far beyond those of other years at this season, and the railways, both East and West, will probably be taxed to their utmost in order to meet their requirements.

Crescent—Two mines in the eastern Ohio coal fields went on strike June 24, throwing 600 men out of work. The men employed at Gaylord mine No. 2 struck on account of the refusal of the company to recognize the uniform outside wage agreement, while the exact nature of the trouble arising at the Crescent mine of the Lorain Coal & Dock Co. over which the men quit work has not been ascertained.

Brilliant—The Royal Coal Co., which controls a large acreage south of Brilliant, is shortly to open its mine which was projected several months ago. At that time trouble was met in securing the right of way for the mine siding, and the opening was delayed considerably on that account. Settlement of this difference has been effected, however, and development of the property will be started soon.

ILLINOIS

Benld—Considering output the three mines of the Superior Coal Co. near here are among the largest in the world. Mine No. 1 is averaging 3500 tons daily and on May 23 last hoisted 3808 tons. Mine No. 2 set a new monthly average in April of 4059 tons daily. During May mine No. 3 averaged 4061 tons a day, or 105,507 tons for the month. On June 6 the three mines broke all previous records, hoisting 12,294 tons.

Carlinville—The Superior Coal Co. have returned the options taken some time ago on land southwest of Benld, as it has been decided to postpone the sinking of shaft No. 4 for an indefinite period. The increased tonnage of the present mines and the extension of the road to connect with the mine at Staunton is the reason assigned for this decision.

IOWA

Knoxville—It has long been known that a vein of coal underlies the village of Pleasantville at a depth of between 300 and 400 ft. S. C. Frost has interested capitalists and raised money upon popular subscription for the purpose of prospecting. He has also employed Knoxville prospectors for this work.

NORTH DAKOTA

Minot—According to the latest reports from the Northern Briquetting Co., lignite briquettes will probably be produced in Minot by Sept. 1. The above named company owns 700 acres of lignite coal land near Burlington and is establishing a plant near the crossing of the Great Northern and Soo line tracks. The necessary briquetting machinery has been ordered and it is expected that the plant will have a capacity of at least 75 tons in a working day of 10 hr.

ARKANSAS

Fort Smith—A number of coal miners were reported entombed after an explosion in a mine at Jenny Lind. Ark., 12 miles south of Forth Smith June 24. It is understood that aid was summoned from the mine rescue station at McAlester, Okla.

OKLAHOMA

Venita—A company from McAlester has unloaded a prospecting drill at Blue Jacket and prospecting for coal will be started at once. No attention will be paid to oil or gas, but a prospect hole will be sunk on the west side of the town in the hope of getting a little closer to the railroad. This will be put down to a depth of at least 400 ft.

ARIZONA

Phoenix—The first of a number of petitions to initiate a law excluding all but English-speaking workmen from the mines of Arizona was filed June 21 with the Secretary of State. Petitions are being circulated in every mining camp and it is believed that the necessary 2168 names will be secured to place the measure before the people at the election in 1914.

FOREIGN NEWS

Cardiff, Wales—The strike called by the miners as a protest against non-unionism in the mines narrowed its area a week from its proclamation to the Rhondda Pit of D. Davis & Sons. The men still on strike, numbering 7000, are receiving financial support from the Miners' Federation.

New Hazleton, B. C.—An active campaign of development in the Kitseukla coal field has been undertaken by J. W. Hart and Wm. McDonald. These prospectors staked their claims last summer and say that they have one seam of coking coal 7½ ft. thick, upon which they will do most of their work. Another bed 2½ ft. thick is reported to be anthracite of good quality.

PERSONALS

Ernest Hutton, of Clarksburg, W. Va., has been recently appointed superintendent of the power and mechanical department for the Elkhorn Mining Co.

D. A. Thomas, English coal magnate from Cardiff, Wales, has been recently visiting various coal operations in the Pocahontas and Winding Gulf district of West Virginia.

H. B. Douglas has been appointed acting general manager in charge of the operation of the Clearfield Bituminous Coal Corporation, with headquarters at Clearfield, Penn. This appointment was made on account of the death of A. R. Shillingford, vice-president and general manager of the company.

J. F. Healy, formerly of Elkins, W. Va., has opened a consulting mining engineering office in Room 1201, Union Bldg., Charleston, W. Va., and proposes to make a specialty of reports on coal lands and subjects relating to coal mining for banks, trust companies, and investors generally, as well as other engineering business. Mr. Healy is a graduate of the Pennsylvania State college, with many years experience in mining engineering in Washington, Montana and West Virginia, as well as for years acting as general superintendent and manager of operations. He also acquired an intimate knowledge of the minutia of coal mining as a boy.

OBITUARY

Edward Nelson Saunders, aged 68 years, prominent in the coal industry of the Northwest and interested in several St. Paul financial institutions, recently died at his home in that city. He is survived by a wife, three daughters and one son.

Peter Donaldson, a partner in the firm of James Watson & Co., also President and Managing Director of the Dayton Coal & Iron Co., of Dayton, Tenn., and a heavy stockholder in the latter company, drowned himself June 24 at Kilcreggan, a watering place on the Clyde. The firm of James Watson & Co. suspended payment on June 11 and the Dayton company made a consignment shortly afterward. It is believed that Mr. Donaldson's act was the result of these business reverses.

COAL AND COKE PATENTS

Gas Producer—W. Hammick, Pittsburg, Kan., 1,060,755, May 6, 1913. Filed July 16, 1912. Serial No. 709,751.

Hoisting Bucket—A. Wirsing, Milwaukee, Wis., 1,060,730, May 6, 1913. Filed Dec. 12, 1902. Serial No. 736,260.

Coal Bit Sharpener—A. T. Upton, Mount Vernon, Ill., 1,061,149, May 6, 1913. Filed Aug. 5, 1912. Serial No. 713,424.

Coal Boring Machine—W. J. Hinds, Grant Town, W. Va., 1,060,840, May 6, 1913. Filed June 29, 1912. Serial No. 706,767.

Superheater for Locomotive Boiler—J. Primrose, New York, N. Y., 1,060,360, Apr. 29, 1913. Filed Mar. 9, 1911. Serial No. 613,349.

Apparatus for Superheating Steam—E. H. Foster, New York, N. Y., 1,060,334, Apr. 29, 1913. Filed Sept. 1, 1911. Serial No. 647,141.

Stoker—H. E. Stover, assignor to Baldwin Locomotive Works, Philadelphia, Penn., 1,060,036, Apr. 29, 1913. Filed May 22, 1912. Serial No. 698,904.

CONSTRUCTION NEWS

Whitesburg, Ky.—An Eastern syndicate has just purchased 5000 acres of rich coal land along lower Parr's Fork on the Knott-Letcher border and is planning an early and extensive development of the property.

West Newton, Penn.—The Connellsville Coke & Fuel Co., is pushing work on the erection of an 80 oven coke plant to develop 105 acres of Ligeonier Valley coal recently bought from ex-judge Charles G. Steel and other Greensburg men.

Lisbon, Ohio—Over two thousand acres of valuable coal land lying north of West Point and along the right of way of the Youngstown and Ohio River Railroad Co., will be extensively developed by the Kirk-Dunn Coal Co., of Cleveland, in the near future.

Birmingham, Ala.—The Pratt Consolidated Coal Co. that recently purchased the properties of the Milner Coal Co. of New Castle, is remodeling No. 6 mine, erecting a temporary tipple and preparing to resume the operation of this development in the near future.

Charleston, W. Va.—T. M. McClenahan, of Charleston, W. W. Keefer, of Pittsburgh, and John Sargeant, of Cincinnati, Ohio, will develop coal lands near Charleston, and are installing a plant to produce 2500 tons daily. The initial cost of this installation will be between $250,000 and $300,000.

Washington, D. C.—Work on the new building of the Bureau of Mines in Pittsburgh for which the last congress appropriated $500,000 is expected to be under way soon. W. G. McAdoo, Secretary of the Treasury, has asked Congress for an emergency appropriation of $15,000 to pay for surveying the plot adjoining Schenley Park which the city gave the government in exchange for the Arsenal site in Lawrenceville.

Edinburgh, Scotland—The Udston Coal Co. is now leasee of the three coalfields in East Lothien, Riggenhead, St. Germains, and Penston, covering a space of about three miles in length. The management met recently to consider the question of erecting 200 to 300 workmen's houses, half of them to be at Macmery, and half at Tranent. At Tranent and Elphinstone, which, when completed, will be productive pits in East Lothien, several hundred additional houses will be erected by the company.

Lexington, Ky.—Over $40,000,000 will be spent in the development of the property of the Elkhorn Fuel Co. within the next few months. It is proposed to build three new mining towns; one on Potters' Fork a mile from the main line of the Lexington and Eastern, which will be reached by a branch line, one on Wright's Fork, and one near Neon, the two last named being on the Lexington & Eastern main line.

Orders for millions of feet of lumber have been placed, two large band saw mills and several planing mills will be installed to work up native lumber, and a brick plant of considerable capacity will be built and its output used in constructing the new cities.

NEW INCORPORATIONS

Connellsville, Penn.—The Lake Trade Coal Co. has been organized at Windber with a capitalization of $25,000.

Columbus, Ohio—The Citizens Ice, Coal & Supply Co. has been organized with a capital of $40,000 at Sidney by Milton Bennett and others.

Osceola, Ark.—A charter has been granted to the Gay-Orr Coal & Ice Co., capital stock $25,000. The incorporators are B. F. Gay, W. E. Orr, and B. I. Gay.

Pittsburgh, Penn.—The Milburn Coal and Coke Co. a corporation organized under the laws of the state of West Virginia has discontinued business and dissolved.

London, Ohio—With a capital stock of $50,000 the Davies Block Coal Co. has been organized by W. B. Catching, McCall Fitzgerald, Sam G. Hardin and M. M. Elliott.

Louisville, Ky.—Amended articles of incorporation have been filed with the county clerk changing the name of the firm of Joseph Walton & Co. to the Pittsburgh Coal Co.

Louisville, Ky.—The O'Donnell Coal Co., capitalized at $50,000 has been incorporated. The founders are Joseph O'Donnell, and M. Lanning. The company will do a general coal mining business.

Kittery, Nova Scotia—The Nova Scotia Coal Iron and Railway Co. has been organized with a capital of $500,000 to carry on the business of mining all kinds of minerals. H. Mitchell is president, and H. A. Paul is treasurer.

Nashville, Tenn.—A charter has been issued to the Flat Creek Coal & Coke Co., of Knox county. The concern has a capital of $50,000 and the incorporators are Thomas Pruden, J. C. Gaut, G. N. Hacker, P. H. Smit, and J. M. Meek.

Charleston, W. Va.—The Coöperative Coal Co. of Charleston, has been organized with a capital of $15,000 to deal in coal lands. The incorporators are C. T. Davis, F. W. Johnson, T. E. McCoy, W. H. King and G. V. Rainey, of Charleston.

Wellsburg, W. Va.—The Ohio River Co. of Wellsburg has been organized to mine and deal in coal and other products. The incorporators are B. Cochrane, Elmer Hough, Robert Wheeler, John K. Paullas, and H. A. Stengle, all of Wellsburg.

Manhattan, Kansas—A charter has been granted to the Manhattan Lumber and Coal Co. with a capital stock of $25,000. The incorporators are, I. L. Inskeep, George E. Cragg, Oliver A. Hutchins, George W. Myers, and M. L. Hastings.

Wilmington, Del.—The General Fuel and Power Co. has been organized with a capital stock of $800,000 to operate coal mines, to manufacture ice, cement, gas, etc. The incorporators are H. E. Robinson, J. Jacobs and Harry W. Davis, all of Wilmington.

Wheeling, W. Va.—The Monroefield Coal Co., has been organized in Morgantown to develop coal lands in Monroe County, Ohio. The capital stock is $10,000 and the incorporators are J. Martin, W. J. Snee, M. C. Martin, E. P. Weaver, and B. C. Weaver of Morgantown.

Charleston, W. Va.—The Elma Mining Co. of Charleston has been incorporated to develop coal lands in Fayette County. The capital stock is $50,000 and the incorporators are R. M. Price, R. S. Stillman, Duke W. Hill, A. C. Collins and Buckner Clay, all of Charleston.

Phoenix, Ariz.—A charter has been granted to the Arizona & Mexico Mines Development Co., to mine coal and other minerals. The capital stock is $1,000,000 and the incorporators are, Sam B. Bradner, W. L. Barnum, M. L. Buckley, and Charles F. Hanson all of Phoenix.

St. Louis, Mo.—The City Coal Co. has been recently organized with Wm. W. Shook holding 34 shares, Philip Riley and Joseph Moriarty holding 33 shares each. The purpose of the new company is to do a general coal and ice business, and the capital stock, which is fully paid up, is $10,000.

INDUSTRIAL NEWS

Cosbocton, Ohio—During a recent thunder storm a bolt of lightning set fire to the timbers in the air shaft of the Henry Lear mine near here.

Louisville, Ky.—William Martin recently sued the Monongahela River Consolidated Coal & Coke Co. for $1000 damages alleging he was injured while working on a barge belonging to the defendant.

Somerset, Penn.—W. T. Hoblitzell, F. B. Black, and J. M. Black, of Meyersdale, recently disposed of their interests in the Meyersdale Coal Co., the heirs of the late J. R. Stauffer, of Scottdale, acquiring the controlling interests.

Columbus, Ohio—The Athens & Pomeroy Coal & Land Co., has leased its coal land in Meigs County to the Calvin Essex Co., of New Straitsville, and arrangements are now being made to operate upon the leases this summer.

Ashtabula, Ohio—The steamer "Colonel James H. Schoonmaker" left Ashtabula June 21 with the largest cargo of coal ever carried on the lakes. This aggregated 13,712 tons and represented 296 carloads, or a train over two miles long.

Washington, D. C.—The Red Bank Milling Co., of New Bethlehem, Penn., has filed a complaint with the Interstate Commerce Commission against the Allegheny Valley division fo the Pennsylvania Railroad and other carriers, alleging discrimination.

Ehrenfield, Penn.—During a recent storm lightning struck the fan house of the No. 8 mine of the Pennsylvania Coal & Coke Corporation, and the fire that followed completely destroyed the building, the fan and the motor. The loss is estimated at $5000.

Omaha, Neb.—Some twelve or more ice and coal companies recently appeared in police court at the summons of Inspector John Grant Pegg to account for their failure to pay the occupation tax amounting to $1 a year for each team and $3 for the company.

Mason City, Iowa—A deal has recently been completed whereby Thompto & Heiny take over the coal business of the Northwood Mfg. Co. The former concern also purchased the coal sheds belonging to the latter and will have them moved from their present location.

Memphis, Tenn.—The test of burning coke in switch engines to eliminate smoke recently conducted by the Southern Ry. in Memphis, has brought the announcement from the officials of that company that the fuel is unfitted for railroad use. It was found to be a poor steam producer, yet cost nearly four times as much as coal.

Montreal, Canada—The rumor is afloat that the International Coal & Coke Co. is expected to reorganize shortly. It is understood that the bondholders will be called together with the ultimate idea of exchanging the bonds for preferred stock. The company is understood to be in good condition but needs additional working capital.

Indiana, Penn.—Considerable drilling has been done in Indiana County by a real estate company said to be the coal land agents of the Pennsylvania Railroad. About $50,000 was spent in drilling, and large tracks of land in Pine, Brush Valley, Conemaugh, Rayne, Grant and Mahoning Townships were thoroughly tested for coal, but no options have been taken.

Toledo, Ohio—Officials of the Pere Marquette and Ann Arbor railways say that the decison of the Interstate Commerce Commission increasing the rates on coal by way of the translake route of the two railways to Milwaukee, Manitowoc and Kewanee will mean a gain in revenue to these roads of approximately $50,000 per annum to the former and $100,000 per annum to the latter.

Birmingham, Ala.—It is reported in the coal mining circles that local coal operators are negotiating for the purchase of the De Soto Mining Co. which operates the Indio mine in the northern part of Jefferson County near Warrior. The De Soto company owns between 8000 and 9000 acres of valuable coal land and the daily production of the mine now operated is between 250 and 300 tons.

Pittsburgh, Penn.—There is a persistent though quiet inquiry for good coal lands throughout the mining region of western Pennsylvania, and some large purchases are being made. For three tracts totaling 67 acres in Hempfield Township, Westmoreland County, Ex-Senator John M. Jamison recently paid $72,500 , or a little over $1082 per acre. The coal purchased, however, is said to be some of the very best in the country.

Denver, Colo.—Prince Henri Decroy, member of the ruling house of Belgium, Camile Perin, managing director of the Societe Generale, Charbonnages of Brussels and W. J. Van Maanen proprietor of the Gazette, an English financial paper of Belgium, will arrive in Denver shortly to take over 30,000 acres of Routt County coal land and to close the deal entered into by Paris and Belgium bankers for the purchase of $28,000,000 in bonds to finance the Yampa Fuel & Iron Co.

Punxsutawney, Penn.—James A. McClain, cashier of the Spangler First National Bank, has taken an option on the MacHenry coal tract on Little Yellow Creek near Nolo, Indiana County. The field consists of approximately 5000 acres and the option price is stated as $100 per acre. The total amount involved, therefore, will be in the vicinity of one-half million dollars. An investigation will be made and if the coal proves suitable for coking purposes an extensive plant will be constructed.

Pottsville, Penn.—The Philadelphia and Reading Coal & Iron Co. has recently installed a storage battery locomotive at the Glendower Colliery, which gives promise of doing away with approximately 70 per cent. of the mules now used in the underground workings. The motor is somewhat similar to those now in operation. The storage batteries are concealed in a large case beneath the car, and are so arranged that they are capable of hauling long and heavy trips of coal for a period of ten to fifteen hours. At night they will be recharged, and be ready for operation the following day. Inasmuch as it has been necessary to use three or four mules for transporting coal on the long gangways, the company officials believe that a very large per cent. of the number of these animals can be done away with upon the adoption of the new style motor.

COAL TRADE REVIEWS

GENERAL REVIEW

Many of the hard-coal consumers have now definitely closed down for the summer and the trade is dull. However, shippers are still somewhat behind, so that there is no campaigning for orders and domestic grades are all steady. With a slightly curtailed production in July, there will probably be sufficient demand to keep the trade steady. Only the smaller sizes are going into storage, and the outlook is favorable for the first two weeks of the current month.

The Eastern bituminous situation continues firm, with coal moving freely. The strike outlook in West Virginia is becoming acute; the entire output of the Pocahontas field is sold up, while the New River district is working on half capacity or less. There is a briskness in the trade that no one is able to account for, and it is evident that the Southern agencies have more than enough orders, so that there is sure to be a broad market for the Pennsylvania grades. Georges Creek producers are being pushed to meet their contracts and are declining orders in all directions.

A further slight decrease in the manufacturing demand is noticeable in the Pittsburgh district, due to the arrival of midsummer. Prices are firm, with premiums occasionally obtainable on spot orders, while the labor and car shortage are still in evidence and will probably become more acute as the summer advances. The Lake movement is heavy, but somewhat delayed by congestion, due to the lack of adequate motive power. There has been an advance in quotations at some of the outlying districts.

In Ohio there is a heavy domestic demand much earlier than usual. The Lake movement continues excellent all along the line, the shipments from the docks in the Northwest being particularly good. The production is heavy, manufacturing demand large and the steam consumption good, due to the heavy railroad movement. There was a heavy dumping at the Hampton Roads piers during the week, the port being almost congested with vessels awaiting tonnage; the exports were particularly heavy, and indications are that they will continue so throughout the summer. There are rumors in the South of a curtailment in the production of pig iron, which will necessitate the blowing out of a number of furnaces; this is naturally having a depressing effect on the local market.

The Middle Western trade is a trifle stronger in spite of the unusually warm weather; this is due probably to the labor trouble in West Virginia, there being a heavy demand in the local market for the Eastern steam coals and an advance expected shortly. There is also some improvement on the local fuels, the mines working better generally, with the car supply excellent, except in spots; when the car shortage develops later, as is expected when the heavy crop movement starts, it is probable that Eastern shipments will be curtailed, which should bring about an advance on the Western coals.

BOSTON, MASS.

Bituminous—The situation on Pocahontas and New River coals is fast becoming acute. Practically the entire output of Pocahontas is understood to be sold up and shippers of New River are said to be getting out only 40 to 50% of the normal output of that district. As a result prices are likely to go higher for spot coal, $3.15 having been paid within a week f.o.b. Norfolk for an emergency shipment. Reports of a suspension through the Chesapeake & Ohio districts are received here with more or less concern, according to individual points of view, but the belief is that with all the Southern agencies abundantly suplied with orders there is sure to be a broad market for the Pennsylvania output. There are a number of fair-sized buyers that have yet to cover on their fall and winter requirements, and there can be no question now that prices will be firm for the balance of the year. The Georges Creek district is being pushed to keep up with the contract business in hand, and sales agents are declining orders in every direction.

The demand is strong for all the better grade Pennsylvania coals, and there are rumors that the shippers are not accepting orders now except for prompt delivery. Prices are firmer from week to week on all brands, and just now there is some hurried buying in the effort to get coal forward before the Gettysburg anniversary celebration, which is expected to work practically an embargo against coal movement in Pennsylvania. All-rail, the market shows signs of steady improvement.

Anthracite shippers are still somewhat behind on their orders. New England, however, is only fairly well supplied, and the prospect is with probably a slightly curtailed output in July there will be enough business to keep the demand steady through the summer months. There is no campaigning for orders on the part of the companies, and practically all schedules for domestic sizes are accepted subject to delay. The steam sizes are also in strong request, particularly for delivery on Long Island Sound.

Current wholesale prices on bituminous are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$1.10@1.45	$1.30@1.65	$1.67@1.77	
Philadelphia*	2.35@2.70	2.55@2.90	2.92@3.02	
New York*	2.65@3.00	2.85@3.20	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				$2.85@3.15
Providence†				3.88@4.00
Boston†				4.00@4.10

*F.o.b. †On cars.

PHILADELPHIA, PENN.

There is much lethargy manifested in the anthracite market in this vicinity. The usually hot weather, and the fact that at this season of the year, many of the homes of the large coal users are closed, has made the local market rather dull, and this condition of affairs is not likely to improve for some time. There was a slight improvement at the end of the month of June, such as is always manifested, due to many of the dealers desiring to get a car or two of coal before the advance, but this business soon ends. The only feature to the market is the tidewater business, which still continues good. It is understood that this trade looks favorable for the first two weeks in July, and perhaps longer. The talk of partial suspension of mining is likely to become a fact in the present month. The mines were closed over the fourth of July, and this may be but the commencement of a period of curtailed mining, which is not unusual at this season. Many of the large operators state that outside of the small sizes little coal is going into stock, but it is the New England market and the large consignments to the Lakes for trans-shipment to the Northwest, which is making this possible. Any cessation of the demand from these directions, is likely to cause storage of prepared sizes.

The bituminous market has slightly recovered from its relapse of last week. Conditions, according to various inquiries, nearly all point to a period of prosperity for sellers of this product, although it must be said that many of the trade look rather for substantial tonnages, than any marked inflation in prices.

NEW YORK

Bituminous—The local soft-coal companies anticipated a dull period during July and August, as is usually the case, but such has not materialized as yet, and indications are that it will not. Stocks at tide water are smaller than usual, inquiries are coming in good, and there is not much coal around. The demand on contract is particularly heavy. In the stock market things are rather quiet, with few sales being made, but nevertheless there is a strong, healthy undertone, and prices are firm in every particular. There are rumors in the local market that Pocahontas has sold during the week at Hampton Roads at $3.50.

The labor situation in West Virginia continues to be the predominating feature in the local soft-coal situation. Should the miners effect a curtailment in production there to the extent they claim they will, the situation will be grave. The market at the present time does not need any strike to improve it. Car supply on the Pennsylvania R.R. has been a trifle uncertain, but entirely satisfactory; on the New York Central the supply has been fully up to requirements. Labor shortage still continues throughout the mining regions.

We quote the New York market unchanged, but strong and firm as ever.

Anthracite—The last week witnessed an active mine

movement among consumers endeavoring to land their stock at the 30c. discount, which expired July 1. As a result, there was a temporary, but abnormal, activity. On the whole, however, the trade is in a strong position, and promises to recede but little over the dull summer period. Producers were looking forward to a depressed market over July and August, but the trade is developing an unexpected strength. There is, however, a good, healthy undercurrent through the market, and while insufficient orders will necessitate some shutdowns during the next two months, it is not expected that this will be of serious proportions.

The hard-coal companies do not report any serious shortage of labor, and seem to be somewhat better off in this respect than the bituminous operators. Stove coal still continues the shortest in supply, with pea and buckwheat the longest; a number of companies report that they are stocking these sizes heavily.

The New York market is quotable on about the following basis:

		Individual		
	Circular	Lehigh	Scranton	Schuylkill
Broken	$5.00	$4.45@$4.65	$4.50@$4.70	$4.45@$4.65
Egg	5.25	4.80@ 4.90	4.85@ 4.95	4.80@ 4.90
Stove	5.25	4.90	4.95	4.90 .....
Chestnut	5.50	5.05@ 5.15	5.10@ 5.20	5.05@ 5.15
Pea	3.50	3.25@ 3.45	3.30@ 3.50	3.25@ 3.45
Buckwheat	2.75	2.10@ 2.45	2.50@ 2.75	2.10@ 2.45
Rice	2.25	1.75@ 1.95	2.25	1.75@ 1.95
Barley	1.75	1.30@ 1.70	1.75	1.30@ 1.70

PITTSBURGH, PENN.

Bituminous—There has been a slight further decrease in manufacturing demand for coal, due merely to the arrival of midsummer. The Lake movement is heavy, and mines in the district are operating at practically as high a percentage of capacity as at any time for years. Prices are firmly maintained, with a disposition to ask premiums on prompt lots of 5@10c. a ton. Prompt slack, however, is quotable at 60@70c. Car supply is fairly good, but there are delays in transit, and a congestion is feared later which would result in a definite shortage. Most of the roads are clearly short of motive power. We quote regular prices unchanged as follows: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in. steam, $1.50; 1¼-in. domestic, $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The Geologic Survey reports the total production of beehive coke in the United States last year at 32,868,345 tons, and the "Connellsville Courier" had previously reported the Connellsville production at 20,000,000 tons, which would indicate that the Connellsville output comprised 61% of the total beehive output of the country, a slight gain in the proportion as compared with five years or ten years ago. On account of the rapid increase in byproduct coke, the proportion of total coke output is not increased. Last year byproduct coke constituted 25 per cent. of the total coke output, showing a great gain in proportion, and with new byproduct plants starting this year, a further important increase in the proportion is certain for this year and next. There is no prospect that the Connellsville region will adopt the byproduct process, as this should naturally be practiced where the coke is consumed, but within a few years the Connellsville region will probably be a large shipper of coal to byproduct plants. At present it labors under a handicap in freights, which average 15c. a ton higher than from the Pittsburgh district, but this condition is likely to be remedied.

The deadlock between Connellsville operators and furnacemen over contracts for furnace coke for second half has not been broken, the operators continuing to insist upon $2.50, while the furnacemen regard this price as entirely too high in view of the pig-iron market. The operators say they are now making the coke price, and it is up to furnacemen to make pig-iron prices to correspond. A partial bridging of the deadlock has occurred by the operators selling several furnacemen July coke at $2.50, thus postponing the necessity of such furnaces to close contracts. In Pittsburgh coke circles, it is thought these sales were with a guarantee, for the prompt market, while firmer, is hardly quotable above $2.25, and $2.50 for July coke thus looks out of line. Demand for foundry coke is moderately good, with prices firm. We quote: Prompt furnace, $2.25; contract furnace, $2.50 asked; prompt foundry, $2.85@3; contract foundry, $2.75@3, per ton at ovens, with a few operations asking $3.25 on contract foundry coke.

BALTIMORE, MD.

Interest in Baltimore trade circles during the week centered in the strike call for July 1 in the New River District of West Virginia, for if there is a serious tie-up in these particular fields it will mean that local operators will be rushed with orders to supplant the supply of New River coal, of which consumers in the West and in New England have been large users. Whenever there is a shortage of New River coal, the consumers look to the local market for their supply.

Even the issuance of the order has had an effect on coal-trade conditions in Baltimore. The market is firm as far as prices are concerned, and fuel is moving freely. Line business is also good. The salesmen who returned to the city during the week reported first-class business.

Anthracite business is light on account of the prevailing warm weather.

Some idea of the activity in the movement of coal may be gleamed from the report of the coal tonnage of the Baltimore and Ohio R.R. for May, 2,995,812 tons being moved as compared with 2,786,580 tons in 1912, an increase of 209,232 tons. The coke tonnage for the month was 432,898 tons, as against 439,631 tons for last year, a slight decrease.

The coke market is weak, and the demand light, the output being about equal to the demand.

BUFFALO, N. Y.

The end of June is when bituminous coal ought to be about as dull as at any time of the year, yet Buffalo jobbers are finding it so difficult to get a supply of Youghiogheny coal that nobody dares to take an order unless the fuel is actually in sight. This means a briskness in the entire trade that nobody can account for. There is considerable slackness in coke, but coal is so scarce that the consumer does not dare to allow his supply to run down.

There is much the same condition of things reportetd from Canada. At one time the competition from Nova Scotia coal extended well west of Montreal and was very sharp, but is now hardly worth mentioning. There is but one complaint of the Canadian trade. There is in many sections a land boom that has tied up money badly. If this speculation turns out well, business generally will not suffer.

The scarcity of both miners and cars grows worse. The eagerness to get a good output causes coal men to take special note of anything that will reduce the production. Accidents often appear to be many, but the loafing of the men and the failure of the car supply, is a constant source of complaint. The worst of it is that as the fall approaches there is prospect of the shortage increasing.

There is no weakening of prices for bituminous coal, jobbers insisting on an advance of all quotations except slack, the list running up to $2.90 for Pittsburgh lump, $2.75 for three-quarter, $2.65 for mine-run and $2.15 for slack. The demand for the latter has been quiet of late, though it is improving somewhat. Allegheny Valley coal is about 25c. below Pittsburgh. Coke is as quiet as ever, the furnace men trying hard to break the market. Quotations remain on the basis of $4.85 for best Connellsville foundry.

In the anthracite trade there is also some complaint of car shortage. Shipping agents are eager to keep the Lake movement up. It has been heavy right along, but the idea is that more coal should be laid down on the Upper-Lake docks than ever before. There is no improvement in the local anthracite market and the all-rail trade is also quiet. It is impossible to stimulate the buying of coal in warm weather for winter consumption. At the same time the agents of independent anthracite mines are active and claim to have secured a better supply than ever before.

The week's shipment of anthracite to the Lake trade was 164,000 tons. The coal still goes to the leading ports chiefly, but there were 11 ports in the list, showing an increase of activity in that direction. Just now Fort William, on the Canadian side of Lake Superior, is a large receiver.

COLUMBUS, OHIO

With a good demand for steam tonnage and the lake trade ruling strong, the coal business has been strong in every respect. One of the best features is the increased demand for domestic grades, which is somewhat earlier than usual. This shows that dealers are trying to place their orders before the expected advance, which will be brought about by a prospective car shortage and other conditions.

The lake traffic is still one of the most active departments of the trade. The docks of the Northwest are in fairly good shape and no congestion of consequence is reported. The movement from all of the Ohio fields is steady, and chartering of bottoms is going on actively. The Toledo docks of the Hocking Valley Ry. Co. during the week ending June 27 loaded 113,000 tons. The present season is expected to be a record breaker insofar as the lake trade is concerned.

The domestic trade in every part of the country which

looks to Ohio for its fuel supply is active. Dealers' stocks, depleted by the recent floods, are being replenished and consumers are placing their orders earlier than usual. Threshing, which will be at hand soon, is expected to produce a demand in rural districts. There is also some activity in school and other public contracts.

The steam trade is still active, although it is being placed in the background by the domestic and lake branches of the business. Railroads are requiring a large tonnage for freight movement. Many factories are having a good run of orders, and as a result their fuel requirements are large. Most of the steam contracts for the coming year have been closed, although some railroad contracts are still unawarded.

The output from Ohio mines during the week was large under the circumstances. In the Hocking Valley, where the car shortage is least noticed, the output is about 90 per cent. of the average, and the same proportion prevails in many of the strictly domestic fields. In eastern Ohio, where the car shortage is the most pronounced, the output is estimated at 60 per cent. In the Pomeroy Bend district there has been a considerable increase in the production during the past few weeks.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.55		$1.60	$1.55
2 inch	1.40	$1.20	1.40	1.35
Nut	1.25		1.25	
Mine-run	1.20	1.10	1.15	1.15
Nut, pea and slack	0.65		0.70	0.65
Coarse slack	0.55	0.70	0.60	0.55

HAMPTON ROADS, VA.

The past week has been a busy one at Hampton Roads, and while the dumpings at all piers have been heavy, it is believed that these at Lamberts Point will more than equal the combined dumpings of Newport News and Sewalls Point. From the beginning to the end of the week, berths at Lamberts Point have been kept filled and the anchorage off the piers blockaded with vessels awaiting their turn.

It is expected that the June dumpings over Lamberts Point piers will show a decided increase over May figures. This is especially true as regards export coal, as heavy shipments to foreign ports have been moving from these piers daily. All through the month of June shipments of export coal have been heavy from all Hampton Roads piers, and it looks as if the foreign demand will continue well on into July.

The labor situation in the New River fields is growing worse daily and is causing much uneasiness. Rumors that the miners will walk out July 1 are reaching tidewater, and suppliers are holding such coal as they may have on hand or in transit and decline to name any prices for coal for early delivery.

The heavy dumpings at Hampton Roads have greatly reduced the number of cars in the various railroad yards, and as the shipments from the mines during the past week have been anything but heavy, the coming week will find less coal on hand for the week's dumpings than there has been for months, with considerable tonnage in the stream waiting for cargo.

BIRMINGHAM, ALA.

There are rumors that several pig-iron furnaces are to be closed down in the near future. As is generally known, the pig-iron market has been declining rapidly for several months, and some sales during the current week were reported as low as $10 per ton f.o.b. cars Birmingham for No. 2 Foundry, which price is below the cost of production of less favorably located furnaces.

Any reduction in the consumption of either coal or coke at this season of the year is bound to have a depressing effect, and would somewhat overthrow the optimism which has prevailed for some time as to the summer prospects of the local coal industry.

The foundry-coke market has not been affected sentimentally or otherwise, and the prices prevailing at this time on Alabama product are higher than for many years past at this particular season. Current quotations, with only limited tonnages offering, are from $3.75 to $4.50 per net ton f.o.b. cars local ovens.

LOUISVILLE, KY.

Coal men, as well as the rest of humanity, expect warm weather in June and July; but it has been a good many years since the country as a whole has known such a June as that which has just passed into history. That the torrid weather which prevailed has had its effect upon the coal market can hardly be doubted. Of course, nothing like an active demand for spot coal for immediate use can be expected during the summer months under any circumstances. Just now, however, it seems that even the majority of the industrial consumers who usually buy at this time, have shut down on their coal supply, and are running on sawdust and other plant refuse.

An important market has been developed in the Northwest, and it goes without saying that the whole district will reap the benefit of the introduction of Kentucky coal into the Middle West, and that within a few years. There appears to be a great and growing demand all through that section for a high-grade bituminous coal, and this demand eastern Kentucky is in a splendid position to fill.

Prices for July delivery are quoted at $1.65@$1.70 for block, $1.60 for block and lump, and $1.40@1.45 for round. June deliveries are very much behind, however, with a large volume of orders still unfilled. There is some fear of a mild car shortage, which would throw deliveries still further behind, but at present the movement is about as rapid as the production of the coal.

KNOXVILLE, TENN.

The coal operators in the Kentucky-Tennessee field are in exceptionally fine spirits, owing to the good condition of the market for this time of the year. It is the prevailing opinion that, for this season of the year, the market has never been in a more satisfactory state. While there has been a slight decrease in the demand for the finer grades of steam coal, there has been an equal increase in the demand for domestic. The result is that the demand for 3-in. steam, nut and slack, which was abnormal some time ago, is now about normal. Prices on 3-in. steam are about the same as 30 days ago, while nut and slack are selling from 5c. to 10c. less.

Considering the season, the larger grades of steam coal are strong—prices running from 5c. to 15c. higher than last year's prices. During the past 30 days, a shortage of cars has been felt, and operators predict that this fall will see a serious situation with stiffening effect upon prices. Many operators are sold up to Sept. 1, and few desire to make quotations, now, for later shipments, as they believe a strengthening market will develop early in the fall.

DETROIT, MICH

Bituminous—The soft-coal market is a trifle stiffer this week, notwithstanding unusually high temperatures prevailing locally. This firmness is attributed to the strike situation in West Virginia, where it is rumored 15,000 men will shortly lay down their tools. At the present moment, the coarser grades are in the greatest demand, slack coal being in good supply on track; mine-run is more plentiful than screened coal, but it is not probable that this condition will prevail long. Both Ohio and West Virginia lump and three-quarter have been steadily recovering from a slight slump experienced a short time ago, and are now nearly back to circular. Contract business at the present time is not brisk, but any further alarming news from the strike zone will cause the buyers to fall into line rapidly.

The local market is quotable on the following basis:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.65	....	....	....	....	$2.25	$2.00
Egg	1.65	....	....	....	....	2.25	2.00
Steam lump	1.35	....	....	....	....	....	....
4-in. lump	1.20	$1.20	$1.20	$1.10	$1.10	....	....
Mine-run	1.10	1.10	1.05	0.90	0.90	1.50	....
Slack	0.75	0.75	0.50	0.60	0.60	Open	....

Anthracite—The hard-coal market is firm, with circular prices being strongly held; the only exception to this rule is on pea coal, which has sold at slightly under the circular. This was due to a concentration of the demand from consumers on the larger domestic sizes, leaving pea to accumulate. Egg and stove are the strongest grades, and seem to be in heavy demand, with nut fair, while the steam sizes are inclined to be inactive.

Coke—The spot market for coke continues unsettled, with the demand limited. There has been a slight decline on Connellsville foundry coke, some of this now being offered on contract at $2.75, with more than $3 being seldom asked. Prompt foundry coke is not so easy, being affected by the labor shortage at the local ovens; the minimum on good grades is about $2.85. Semet Solvay is quoted at $3 on all sizes, with gas house, $2.85, f.o.b. ovens.

INDIANAPOLIS

There is some improvement in conditions at Indiana mines, reports showing they are working better than half time. Prices remain at the midsummer level. The wheat harvest is on, and while the acreage is short, the yield is good, and a total crop of not less than 30,000,000 bu. is expected. This looks big compared to the 10,000,000 bu. last year when most of the crop was winter-killed. The oat crop is poor, but is

offset by the wheat crop. The corn crop is progressing finely, in a big acreage.

Coal dealers report the situation satisfactory, and say general trade and industrial conditions are beginning to reflect the confidence inspired by the crops. Operators say there has been a slight letting up in the demand for Eastern coals. The season started off with a rush, following the anthracite shortage of the winter. The call for hard coal and Pocahontas was so insistent as to interfere seriously with the Eastern bituminous demand; and some May orders for the latter are not yet filled. A peculiar feature is the plentifulness of chestnut, which has been hard to get for several seasons, and in which there was a practical famine last winter. Nobody seems to know what makes this grade so easily obtainable this year. Notwithstanding all this, the official railroad report shows over 60,000 idle cars, but it appears probable that few, if any, of these are coal cars. The supply of cars at Indiana mines is ample, but there is some trouble on the Chesapeake & Ohio, particularly the Big Sandy branch, and on the Baltimore & Ohio. Some wholesalers are pessimistic enough to predict a car shortage this fall as bad as any in the history of the roads.

CHICAGO

There is a heavy demand at the present time in the Chicago market for Eastern steam coal and an increase in prices is anticipated. Producers of a large number of Western coals report that a comparatively small volume of business is being transacted.

Local dealers express the opinion that a car shortage will develop within the next few months on account of the crop movement and that a curtailment in the supply of Eastern coal will be followed by a large number of buying orders for Western fuel. Prices for spot mine-run are quoted all the way from $1.40@1.50. Both lump and egg coal are selling at from $2@2.25 a ton on the spot market. The market for Hocking coal is active, and an advance in prices of 5c. a ton was effective July 1. The amount of anthracite coal shipped into this territory is increasing and prices remain firm. An increase to $1.50 a ton in the price of Franklin County lump and egg coal went into effect last Tuesday. Low-grade screenings command from 80@85c., while prices for better grades range from 85@90c. The coke trade continues to be active.

Prevailing prices are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump	$1.97@2.07	$2.55	$2.27	
Egg		2.55		$3.94@4.20
Steam lump	1.82@1.87		2.07	
Mine-run	1.77@1.82	$2.20@2.30	1.87	3.30
Screenings	1.62@1.67	1.90@1.95	1.62@1.67	

Coke—Connellsville and Wise County, $5.25@5.50; byproduct, egg and stove, $4.85; byproduct nut, $4.75@4.85; gas house, $4.50@4.60.

ST. LOUIS, MO.

There has been little change in the trade conditions in St. Louis in the past two or three weeks. It was expected a few weeks ago that business would become good about July 1, but indications now are that coal will drag until after July 15 or possibly the beginning of August.

It is a hard mater to make the trade realize that there is a car shortage staring them in the face, and that at least half a dozen mines are in the hands of receivers who will not operate them, so that when the demand for coal becomes general there will be an actual shortage.

Selling below cost is still general in the Standard field, while Carterville is picking up. There is practically no smokeless for this market, and indications are that very little of this coal will come in here for the balance of the season. Coke is also a drug on the market at the present time, and anthracite is being thrown in here in a volume so great as to overcome the demand for it, with the result that it is nearly always under demurrage on the east side.

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.80@0.85
3-in. lump	.....	.....	.....	.....
6-in. lump	$1.15 @ 1.25	.....	.....	0.85@0.90
Lump and egg	.....	$2.00	$1.20	.....
No. 1 nut	1.10 @ 1.20	.....	.....	.....
Screenings	0.80 @ 0.85	.....	.....	0.75@0.80
Mine-run	1.00 @ 1.10	.....	.....	0.75@0.80
No. 1 washed nut	1.40 @ 1.50	.....	.....	.....
No. 2 washed nut	1.25 @ 1.30	.....	.....	.....
No. 3 washed nut	1.25 @ 1.30	.....	.....	.....
No. 4 washed nut	1.25 @ 1.30	.....	.....	.....
No. 5 washed nut	1.00 @ 1.05	.....	.....	.....

St. Louis prices on July anthracite are: Chestnut, $7.25; stove and egg, $7; grate, $6.75; smokeless lump and egg are $4.65; byproduct coke, $5.10, and gas-house coke, $4.85.

PRODUCTION AND TRANSPORTATION STATISTICS

BALTIMORE & OHIO

The following is a comparative statement of the coal and coke movement over this road for May and the first five months of this year and last year:

	May		5 Months	
	1913	1912	1913	1912
Coal	2,995,812	2,786,580	13,604,039	12,557,130
Coke	434,898	439,631	2,050,968	1,860,883
Total	3,430,710	3,226,211	15,655,007	14,418,013

FOREIGN MARKETS

GREAT BRITAIN

June 20—Coal-market conditions are without material changes. As regards prompt coal, the inquiry for all descriptions is slow, while the tendency in prices is still unsteady. Very few transactions have been recorded recently for forward delivery, the ideas of buyers and sellers showing too much disparity.

Quotations are approximately as follows:

Best Welsh steam	$4.68@4.92	Best Monmouthshires	$4.20@4.38
Best seconds	4.44@4.56	Seconds	4.03@4.14
Seconds	4.20@4.32	Best Cardiff smalls	2.40@2.52
Best dry coals	4.44@4.56	Seconds	2.28@2.40

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days.

COAL SECURITIES

The following table gives the range of various active coal securities during the week ending June 28:

Stocks	Week's Range High	Week's Range Low	Week's Range Last	Year's Range High	Year's Range Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	28	26¾	27¼	41½	24½
Colorado Fuel & Iron Pref.	....	....	155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Lehigh Valley Coal Sales	225	210	215	....	....
Island Creek Coal Com	48	48¼	48¼	....	....
Island Creek Coal Pref.	85	84	84	....	....
Pittsburgh Coal	16	15½	16	24⅜	14½
Pittsburgh Coal Pref.	77	74	77	95	73
Pond Creek	16½	17	16½	23¾	16½
Reading	158⅜	155¼	158⅜	168⅜	151⅞
Reading 1st Pref.	....	....	86	92½	86
Reading 2nd Pref.	86	86	86	95	84
Virginia Iron, Coal & Coke	40	39	40	54	37½

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g. 5s	93⅜	Sale	93⅜	93⅜	93⅜	99½
Colo. F. & I. gen. 6s	..	..	107¼	June '12	..	..
Col. Ind. 1st & coll. 5s. gu	79	79½	79	79¾	77½	85
Cons. Ind. Coal Me. 1st 5s	..	..	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	92½	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102⅜	April '06	..	..
K. & H. C. & C. 1st s f g 5s	..	..	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	..	86	86½	86½	86	87½
St. L. Rky. Mt. & Pac. 1st 5s	70	78	76	June '13	76	80
Tenn. Coal gen. 5s	99⅜	Sale	99¾	99¾	99¾	103
Birm. Div. 1st consol. 6s	100½	102¼	101	April '13	101	103
Tenn. Div. 1st g 6s	100	102	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	..	103	110	Jan. '09	..	..
Utah Fuel 1st g 5s	..	..	..	..	..	..
Victor Fuel 1st s f 5s	..	80	80	May '13	79¾	80
Va. I. Coal & Coke 1st g 5s	92	Sale	92	92	92	98

DIVIDENDS

Delaware, Lackawanna & Western Coal—Dividend of 2½%, payable July 15 to holders of record July 1.

Lehigh Coal & Navigation Co.—Dividend No. 139 of 2%, payable Aug. 30 to holders of record July 31.

Lehigh Valley Coal Sales Co.—Regular quarterly dividend 2½%, payable July 21 to holders of record July 10.

Nova Scotia Steel & Coal Co., Ltd.—Regular quarterly dividend on the common of 1½%, and on the preferred of 2%, both payable July 15 to holders of record June 30.

Pittsburgh Coal Co.—Regular quarterly of 1¼% on the preferred, payable July 25 to holders of record July 15.